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Presented by
William Wheeler
to
The Royal College of Physicians

august 1898

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TRANSACTIONS

OF THE

HASTINGS & ST. LEONARDS-ON-SEA HEALTH CONGRESS.

1889.

PRESIDENT:

BENJAMIN WARD RICHARDSON, M.D.;
LL.D., F.R.S. F.S.A.

HASTINGS:
Printed by F. J. Parsons, *Observer* Office, Claremont.
1890.

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PREFACE.

The volume herewith presented to the public is made up of the Transactions of the Hastings and St. Leonards Health Congress and Health Exhibition, held at Hastings, in the month of May, 1889.

This Congress was the second of the kind that has been called together by the independent action of the inhabitants of a single town, having been planned and carried out on the method of the Brighton Health Congress, held in the year 1881. Dr. Benjamin Ward Richardson, F.R.S., who presided at the Brighton Congress, was invited to perform the same duty for Hastings, and, in accepting the office, undertook to arrange all that was necessary for dividing the work into sections, for obtaining Presidents of Sections, and also for obtaining Lectures, Addresses, and Papers, to be delivered or read at the different meetings. This left the Mayor (Mr. Councillor Stubbs) and Local Committee free to carry out the details of the Exhibition and the other local proceedings, free of all trouble and responsibility in regard to the scientific and literary part of the Congress.

The President was so fortunate as to secure the able services of Mr. Wilson Noble, M.P. for Hastings, Major-General Webber, C.B., and Dr. Bagshawe, F.R.C.P., as Presidents of Sections, with other very distinguished men as readers of papers and speakers, including Earl Fortescue, the veteran sanitarian, Sir Edwin Chadwick, Sir Spencer Wells, Professor Hughes, Mr. Wyke Bayliss, Professor Ayrton, Dr. Greenhill, Dr. Humphreys, Mr. Shirley Murphy, and the many other gentlemen whose labours are recorded in these pages.

The Executive, in publishing the transactions resulting from the labours of all who have contributed to the volume, have much satisfaction in acknowledging the support with which they were honoured on every side. The list of Vice-Presidents is of itself a proof of the success which attended their efforts; but in fact there was no one concerned to whom they are not indebted. To the Mayor, whose untiring labours will be long remembered, to the General Secretary, and to the Secretaries of Sections, the Members of the Executive who were not officers are deeply grateful.

The Members of the Executive, one and all, hope that the work now completed will not only prove of service to Hastings and St. Leonards-on-Sea, but, by being disseminated far and wide, will be also of some service to the public at large, and an incentive to other Towns to follow the example which has been now set by two of the favourite health resorts of these Islands.

THE HASTINGS AND ST. LEONARDS-ON-SEA
HEALTH CONGRESS,

HELD IN THE
ROYAL CONCERT HALL, WARRIOR SQUARE, ST. LEONARDS-ON-SE
APRIL 30th to MAY 4th, 1889.

President of Congress:

BENJAMIN WARD RICHARDSON, M.D., F.R.S., LL.D., F.S.A.

Presidents of Sections:

A. WILSON NOBLE, Esq., M.P. **B.** MAJOR-GENERAL WEBBER, C.B., R.E.
C. FREDERIC BAGSHAWE, M D., Cantab., F.R.C.P.L.

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(Secretary General Société Francaise d'Hygiène)
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THOMAS SUTHERLAND, M.P.
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Sir T. SPENCER WELLS, Bart.

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Rt. Hon. The LORD MAYOR of YORK.

The MAYOR of BARROW-IN-FURNESS.
The MAYOR of BASINGSTOKE.
The MAYOR of BLACKBURN.
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The MAYOR of CHICHESTER.
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The MAYOR of EASTBOURNE.
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The MAYOR of RYE.
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THE EXHIBITION.

◆

The Exhibition, in connection with the Congress, was opened on Monday, April 29th, by His Worship the Mayor and Mayoress (Mr. Councillor and Mrs Stubbs), supported by Dr. B. W. Richardson, Sir E. Chadwick, their Worships the Mayors of Lewes, Rye, Westham, Croydon, Lichfield, Colchester, and Hythe, many Members of the Borough Council, the Executive Committee, and most of the influential inhabitants of the Borough. The Exhibits were of the nature of Domestic and Sanitary Appliances and Articles of Domestic Use and Economy, and were classified under the following heads :—

Class 1.—Building Materials, Construction, and Machinery.
Class 2.—Water Supply and Sewerage.
Class 3.—Heating, Lighting, Ventilation, and Electricity.
Class 4.—Personal Hygiene, Domestic Labour-Saving and Educational Appliances.
Class 5.—Foods, Filters, Drugs, and Disinfectants.
Class 6.—Miscellaneous.

The Exhibition was closed on June 15th, having been open seven weeks, and was, by impartial witnesses, stated to be of a most complete and successful nature.

The Congress and Exhibition were carried out by a Local Committee, by the aid of a Guarantee Fund, raised by the Townspeople and neighbouring Nobility and Gentry; the minimum guarantee being five guineas. The list of Guarantors is printed at the end of the Transactions.

LIST OF ASSOCIATES.

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Wood, Mrs., Chapel Park Road
Woodhams, Mr. J., 50, Havelock Road
Woodhams, Mrs., 50, Havelock Road
Wright, Mr. Macer, St. Helen's Road
Young, Mr Keith D., 17, Southampton Row, W.C.

JOURNAL

OF THE

HASTINGS AND ST. LEONARDS-ON-SEA

HEALTH CONGRESS,

WHICH COMMENCED

On Tuesday Evening, April 30th, 1889.

THE OPENING ADDRESS

Was delivered in the Royal Concert Hall, by

THE PRESIDENT,

BENJAMIN WARD RICHARDSON, M.D., LL.D., F.R.S., F.S.A

At Eight o'clock.

SECTION A.

SANITARY LEGISLATION.

PRESIDENT—

WILSON NOBLE, M.P.

SECRETARIES—

G. G. GRAY, LL.D. E. R. MANSELL, M.R.C.S.

Wednesday, May 1st.

Ten a.m. to 1.30 p.m.,

PRESIDENT'S Opening Address.

CHARLES DRYSDALE, M.D.—The Agricultural Utilization of Sewage.

HUGH ALEXANDER—The Status of Sanitary Inspectors.

RICHARD GREENE, F.R.C.P., Edin.—The Hygiene of Asylums for the Insane.

SHIRLEY MURPHY—Legislation for Prevention of Milk Infection.

ALFRED HAVILAND, M.R.C.S.—Suggestions for a Governmental Geographical Survey of Disease.

(Discussion followed the reading of Papers.)

Three p.m.

SPECIAL PAPER AND DISCUSSION.

SIR E. CHADWICK, K.C.B.—Death Rates and the Census.

Eight p.m.

A CONVERSAZIONE given by the MAYOR & MAYORESS (Mr. Councillor and Mrs. STUBBS) to the Associates and Guarantors.

SECTION F.

MUNICIPAL SANITATION (Health of Towns).

PRESIDENT—

MAJOR-GENERAL WEBBER, C.B., R.E.

SECRETARIES

B. H. ALLEN, M.D. COUNCILLOR BRAY.

Thursday, May 2nd.

Ten a.m. to 1.30 p.m.,

PRESIDENT'S Opening Address.

W. A. GREENHILL, M.D., Oxon.—On the Mortality and Public Health of Hastings.

G. WATTERS, M.D.—Farmyard Sanitation.

H. COLBORNE, M.R.C.S., F.M.S.—Meteorology of Hastings.

H. F. LESTER, LL.B.—The Abattoir System.

E. A. GRATTAN—Model Abattoirs in Belgium.

P. H PALMER, Assoc. Memb. Instit. C.E.—Water Supply of Hastings.

KEITH D. YOUNG, F.R I.B.A.—Circular Wards for Hospitals.

F. BAGSHAWE, M.D., Cantab., F.R.C.P.—On Circular Wards at the Hastings Hospital.

(Discussion followed the reading of the Papers.)

1.30 p.m.

Luncheon, given by the East Sussex Medico-Chirurgical Society, to the President, the Mayor of Hastings, Readers of Papers, and Secretaries.

Three p.m.

SPECIAL PAPERS AND DISCUSSION.

E. HAWARD, M.D., F.R.C.S.—The Disposal of the Dead.

F. SEYMOUR HADEN, F.R.C.S.—Earth-to-Earth Burial.

SIR T. SPENCER WELLS, Bart., F.R.C.S.—Cremation.

Eight p.m.

Address by H. HUMPHREYS, M.A., M.D.—Educational Overstrain.

SECTION C.

DOMESTIC SANITATION,

INCLUDING

EDUCATION.

PRESIDENT—

FREDERIC BAGSHAWE, M.D., Cantab., F.R.C.P.

SECRETARIES—

T. H. COLE, M.A.
H. HUMPHREYS, M.A., M.D.

FRIDAY, MAY 3RD.
Ten a.m. to 1.30 p.m.

PRESIDENT'S OPENING ADDRESS.

WYKE BAYLISS, F.S.A., P.R.B.A.—Sanitary Reform in Relation to the Fine Arts.

Miss M. A. CHREIMAN	Physical Culture of the Young.
EDWARD TIDMAN, C.E. ...	The Registration of Architects.
Lady MOUNT-TEMPLE	Woman's Work in Sanitation.
B. W. RICHARDSON, M.D., F.R.S.	Purification of Air by Ozone.

(Discussion followed the reading of Papers.)

Three p.m.

SPECIAL PAPERS AND DISCUSSION.

J. KNIGHT	Vegetarianism in Relation to Health.
CHAS. DRYSDALE, M.D.	A Mixed Diet.

Seven p.m.

CONGRESS BANQUET at the Queen's Hotel.

SATURDAY, MAY 4TH.

Ten a.m. to Seven p.m.

EXCURSION OF ASSOCIATES

TO

BATTLE ABBEY,

ASHBURNHAM HOUSE,

AND

NORMANHURST COURT.

By Special Permission of

HIS GRACE THE DUKE OF CLEVELAND, K.G.,
THE RIGHT HON. EARL ASHBURNHAM,
THE RIGHT HON. LORD BRASSEY, K.C.B.

Eight p.m.

A LECTURE TO THE WORKING CLASSES.

By the President, B. W. RICHARDSON, M.D.

ON

THE HEALTH OF THE BODY,

Illustrated by

The Oxy-Hydrogen Light,

Shewn by the Rev. A. B. COTTON

OPENING ADDRESS.

THE HEALTH OF THE MIND.

BY THE PRESIDENT,

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In a late number of one of the great organs of public opinion an observation was made, in a leading article, respecting the scope and value of sanitary science. The observation had reference to a public event over which it had been my privilege to preside, and at which a number of the leading spirits of sanitation paid a richly deserved tribute of respect to the most revered and honoured sanitary scholar of the century. The words used by the publicist who commented on the subject ran as follows:—

"We have no wish to write as if it were the chief duty of men to preserve their own health; and though we have no desire to see the world absorbed in an ignoble struggle to add a year or two to the average span of human existence, we see no real reason to regard a sensible solicitude for sanitation as materialistic. At least we should not be satisfied until we have counteracted the evil effects of civilisation, and secured mankind against the poisons which are generated by the artificial conditions under which we live at the present."

These words, critical as they are, ought not to be accepted by us sanitarians as without weight or intention. They are the words of a man who has given thought to them, and who has expressed what a great many persons believe, yet do not so clearly and plainly affirm. It is true they are founded on a most serious error, namely, that civilisation has led to an increase of the spreading diseases or plagues infecting mankind, an error which the learned authors Marx and Willis corrected half a century ago in their brilliant work on "The Decrease of Disease by Civilisation;" and it is true also that they are founded on another error, namely, that the whole object of sanitary science and art, on its physical side, consists of methods for the extinction of the communicable diseases. But the worst error conveyed in the passage I have read is one that is implied rather than openly expressed, namely, that all the science and art of sanitation, the *summum bonum* of it, is included in the physical effort to prevent and annihilate physical disease.

That the effort of removing and preventing physical diseases is a most important part of sanitation we must admit; that up to the present time this effort has been considered the main part of sanitation we must admit; that there has been so much to do in this part that little time has been left for anything else we must also admit; and yet if this were all, if this were really the *summum bonum*, then, immense as the work may be, it is not of the highest class; it is open to the criticism which has been passed upon it; and it ranks rather amongst the expedient than the progressive steps of mankind. It is my desire to-night to take advantage of the opportunity for indicating that the sanitarian having done so much in sanitation from a physical point of view, has now to move into wider and grander fields of research and practice. I want to declare from this platform the mental side of sanitation, and to indicate that from the present time forward the health of the mind, not less than the health of the body, belongs to the care of the true and earnest student of sanitary science.

HEALTH, MENTAL AND PHYSICAL.

We have been accustomed, in thinking of the health of the mind, to look upon it as subordinate or secondary to the health of the body. There is a well-known saying which is on everyone's lip, *Mens sana in corpore sano*—a sound mind in a sound body—which saying has become interpreted, by common consent, into meaning that if the body be sound the mind must be sound. The proverb does not actually convey that idea; it simply suggests that a sound mind in a sound body is a good combination; it gives no precedence to the body, nay, it puts the mind first, as if it supposed a sound mind as the precursor of the sound body. *Mens sana.* And this is a perfect reading of it. There have been some philosophers--some, indeed, of the best—who, holding the opposite view to that which is now commonly held, have traced to the mind all the evils which appear in the body. Thus the prince of philosophers, Plato himself, teaches that all evils of the body proceed from the mind—and Democritus is quoted by industrious and quaint old Burton, in his "Anatomy of Melancholy," as teaching that if the body should bring an action against the mind, surely the mind would be cast and convicted; that by her supine negligence she had caused such inconvenience, she having authority over the body, and using it for an instrument, as Cyprian says, as a smith doth his hammer. It is not necessary for us now to follow out the subtle argument that is here introduced in regard to the intimate relationships of mind and body. We are fully conversant with the fact that the body can be injured through the body without any direct instrumentality of the mind; for, in point of fact, all our sanitary labours have been carried out under the conception that the success of our work consists in detecting and removing those obvious external causes of disease by, and through which the bodily organs, including the organs of the mind itself, may be and are affected; but we are not so conversant with the study of the health of the mind primarily, and independently of the body, and of the health of the body as dependent on that of the mind. I propose, therefore, in this address to dwell on this latter topic entirely, and to try and open up some new thoughts in relation to it.

Setting forth on this new path, I observe, on the first outlook, that the phenomena which connect themselves with the study of the mental origins of disease present the closest analogy with the phenomena connected with the physical origin of disease. We say, when we are thinking or speaking about the diseases which are of physical origin, that they are the results of uncleanliness; and we proclaim, in relation to the removal and extinction of such diseases, that cleanliness is next to godliness. We say of physical causes that they are infectious or contagious in their action. We say, in respect to physical agencies inducing disease, that they are most active in particular seasons of the year. We ascribe to different ages of life different effects of physical influences acting upon the health. We declare of the causes which excite to disease, through physical action, that they are modified, increased, or reduced in intensity, by the quality of heredity; and when we come to look at causes affecting the health of the mind we discover analogies of the clearest kind. These analogies are facts to be remembered, as greatly simplifying our present study. Unfortunately, they do not exhaust it, for there are in the mental phenomena of disease some causes of disease which stand out by themselves as causes, and which perform a double injury, in that they affect not only the mind itself, but the body through the mind. There is, moreover, a mutual reaction between the mind and the body, in regard to the health of each, which is most close and important. We know that the state of the body affects the state of the mind; we know that the state of the mind affects the state of the body.

These are facts of everyday knowledge; we feel within us the two distinct natures, warring with each other, or in accord with each other, or helping each other, and, as it were, reasoning with each other, although it is only the mind which, recognising itself as well as its body, really reasons. We feel, and are strangely conscious of all this, but what we do not feel, and do not appreciate, what we have yet to learn to appreciate, is the independency of the two empires of mind and body, as well as the dependency of the one on the other. We are conscious that the food of the body influences the health of the mind, as when we say of some unsuitable or indigestible thing, "It has made me dull of mind, it has made me sad, it has made me irritable, or has in some other way affected my equanimity." But we do not recognise with like readiness and in the same way the effect of the foods of the mind on the mind and its health; nor is this remarkable, for the body feeds perceptibly, and by one stomach alone, whilst the mind feeds imperceptibly, by five stomachs, by every sense, which is to it a veritable stomach from and by which it receives its aliment, be that good or bad, and from which it is renewed and from day to day sustained. These foods of the mind, entering the mental organisation, the *camera nervosa*, largely, if not altogether, mould that organisation into set form, according to its quality for moulding. They are so like the touch of the sculptor on the clay, that, to a great extent, all men and women born shape their mental surface according as they are led to give it form and shape. I could not, if I should search for years, find a better simile. Common foods and drinks that make the matter of the body must be healthy, in order that the body may be so; and the impressions which enter the body by the senses, the foods and drinks of the mind, must also be healthy, in order that the mind may be so. Granting, therefore, that the substance is good, and the moulding or modelling good, all will be good; there will be the *mens sana in corpore sano.*

The Sanitarian, when he is looking after the pure things out of which the body shall be constructed, the pure food, the pure drink, the pure air, the pure warmth, is fulfilling the physical part of his duty. Whenever he is taking care that with the materials for construction no evil or deleterious thing shall enter, he is performing his legitimate part on the physical side. He is preserving the material of life from physical contamination; he is giving to the bodily form its perfect shapes and qualities. To complete his task he must add to his studies the study of the health of the mind, that luminous receptive surface which changes the mere material substance, the clay, and gives it, according to the depth, the purity, the equality, and the brightness of itself, the health of itself ; its innocence and its sanity ; its approach towards the one pure and sane mind from whence it proceeds, and to which it must return. Let us follow this out in orderly form.

MENTAL PURITY.

In the new study of this, to them, dual art, the coming school of sanitarians will take up a new sanitation. The students of this school will begin, as their physical predecessors began, by training into health from simple principles ; and, as uncleanliness of mind is the most obvious sign of mental disease, and cleanliness the surest indication of mental health, they will strive to discover the prime sources of mental impurity, and will strive equally to introduce, in the place of the unclean influences, the clean and the wholesome. The field of the research here is as wide as the field of humanity, and of all studies is the most absorbing. It includes the primitive study of the conditions leading to the perfect mould of mental health ; a study old as man is old, and yet young as the youngest of men. It involves the problem of the fashioning of the child from the first moment when it begins to feed on the universe, by its eyes, its ears, its touch, its taste, its smell. It is the study of these first mouldings into the modifications of mind incident to the train of years and changing scenes, from the first gasp of the breath to the last exhalation of that vital spirit. There seems a wide field for discovery here, and yet, wide as it is, there are at once displayed upon it certain plain truths which are immediately practical in their nature and influence as bearing on the health of the mind. One primary truth, for example, at once comes forth, that the mental food most early and most continuously and most repeatedly supplied, is that which, for health or disease, most potently affects the mental surface, and carves its place upon it. But the feeding of the mind governs the appetite of the mind, and by what the senses take in the health of the mind is good or bad, clean or unclean. Each sense makes its own bed. Let the eye for long series of years take in no view save that which is squalid, and common, and impure, and by that custom the mind will represent the fashion of what it sees. For art, for beauty, it will lose its primitive adaptability, whatever that may have been, and after a set time for attaining its maturity, it will remain, in respect to purity of sight, a deformed mind, one that can at best only be partially and imperfectly improved. A mind so deformed is never in perfect health and strength. Why for it shall the earnest sanitarian plead for open spaces, flowers, a clear sky, a clean street, an artistic dwelling, all that makes life strongest and happiest? Why, indeed?

The difficulties we sanitarians are compelled daily to meet in our work of reform, lies, beyond any description that could here be given, in unhealthiness of mental visions. The visions of our forefathers, for what reason should they be altered? Am I not to be content with what is? Why should any changes be introduced in my time? So reason they who, from what is called apathy of mind, cherish the worst and most unhealthy errors. On minds so attuned we waste our powers in argument. As well argue about colours with one who is colour-blind. We need not argue. We must get the *young* mind to learn the scenes of the pure and the beautiful, and our ultimate triumph is then secure.

Do you ask me to give you some practical idea bearing on this point of mental health and its guardianship? I will give it straight. I will take the illustration from the schoolroom, where the first mental foods are administered. Every man and woman now present is, to a larger degree than he or she has the slightest conception of—until he or she reasons it out from memory and comparison—the reflex of that market-place of the mind, the schoolroom. The first care of the teacher should be the room of the taught.

Let that room be bright, cheerful, healthy, and life begins from a good mental starting point. Let that room be dark, littery, melancholy, dirty, and the presage of life is injured from the starting point.

Some quarter of a century ago my professional duties led me to the examination of certain schools attached to Union Workhouses, in which children were herded together in rooms unfit for lower animals. They were one and all the victims of low health physically, and the medical officers were in despair what to do with so much chronic and hopeless feebleness as prevailed amongst them. But this, bad as it was, was only part of the evil. There was the addition of the mental misery and impoverishment. I observed that such schools made poverty, bred it, nursed it ; made misery, bred it, nursed it ; made mental disease, bred it, nursed it. I gave great offence for my plainness of speech, for which I had no reason to care since the disclosure of the existing evils led to important ameliorations, and I knew that regarding such centres of gloom nothing less could be said that could lead the so-called scholars into a purer and better mental condition. These observations had reference to schools of a low class and of a past day, since which day there has been a march of improvement. Still the march is slow and very faulty. My eye recalls at this moment schools, where the children even of the well-to-do are taught, in which perennial gloom is spread like a pall over the mental life, and in which the effects on the after career are, of necessity, sad and unwholesome. Better off, indeed, now, are the children of the poor in some of the bright country Board schools than the children of the rich in the dismal cloisters where they sit in classes from year to year, within four walls in which the sunlight has no full play, in which no flowers are seen, no pictures, nor anything of beauty to gladden the sight. These sad schools are to the sight of the mind uncleanly. Let them be reformed, and reformation in the scholar will follow on and on to the end of life ; the house will become pure, the study or office will be orderly, the bedroom will be healthy, because the mind has been taught to become pure, orderly, and healthy.

In many other ways health of mind through cleanliness of the sight will extend, as the art of attaining mental salubrity is extended. Nor will the sight alone share in the advancement; the sense of hearing will be purified. In the early part even of this present reign, great statesmen, great soldiers, great lawyers, and other great men were given, on occasions, to express themselves in terms and words which in these days would savour almost of insanity, in terms and words that no person of respectable life would now listen to without shame; and, still amongst the most unwholesome and mentally unhealthy of our people, the same uncleanliness lingers. Where it lingers health cannot be. Physical health will not be clad in dirty raiment, mental health will not be tolerant of uncleanly language, nor of language false or foolish. The true sanitarian must learn to train the ear to the purity of discourse, as he would to perfect music, or as he would train the skin to purity of water, and the eye to purity of sight.

The olfactory sense comes also under the health of the mind. By the olfactory sense the mind naturally should learn, with an acuteness amounting to genius, the presence of most of the physical causes that lead to the most serious and devastating diseases. Sir Edwin Chadwick, in one of those happy observations which so often fall from him, says that the physical condition of a whole nation might be told by a nose sufficiently critical. And the statement is true. Unfortunately the sense of smell is not yet so freed from the odours of disease as to distinguish, with due refinement, where there is and where there is not every hurtful thing that gives a venomous odour; but this want of refinement is due merely to absence of purity and to deficient knowledge of the odours that are injurious. The detective sense is blunted, and often so much blunted that the worst odours are unknown to the mind, and being unknown, allow the causes of diseases to enter without the vaguest suspicion of their presence.

Again, the health of the mind, so strongly affected through the senses, is not less affected by the tastes of things that reach the mental surface through the palate. What lower mental health can there be, what lower standard of mental condition, than that of the sensual palate that shall find relish in putrifying food, and that, like the lower palates in creation, shall be delighted to feast on garbage? Yet I myself have twice in my professional career known death to follow the corrupt enjoyment of this disgusting taste. And what again of the bad mental health that cultivates a desire for excessive gluttony of taste, that craves for that rich unwholesomeness of foods and drinks which is as sure to bring disease of body and mind as the mere act of swallowing them is sure? We shall hear in the present Congress this question of the palate and its tastes discussed on its physical side. But let us not forget the mental side; let us feel certain that on the mental side also there is a say, and that the mind that is nearest to purity and simplicity, in the matter of cleanliness of that which reaches the first portals of the body, is the nearest to the mind which is healthiest, purest, and best.

Let us not forget, lastly, that the mind is fed by the sense of touch, and that even in touch there is an art of sanitation. Refinement and firmness in this sense is one of the choicest evidences of good mental health; want of refinement, want of firmness, want of precision, is one amongst other proofs of bad health of mind. Thus the sense of touch becomes, as it were, a gauge or test as well as an aid to the maintenance of mental health

If the day should ever come, as I trust it may, when the sanitarians, in full force, shall form a school for teaching all that pertains to their work, they shall find in this department of it free scope for the establishment of a professorship treating solely of the food of the mind for the health of the mind, and thereby of the body likewise: the clay, and the spirit that not only moulds the clay, but fills the mould.

MENTAL CONTAGION.

The illustrious French philosopher, Esquirol, first clearly defined, under the term "moral contagion," that in the study of mental phenomena there may be detected variations of action, and divergencies from the ordinary or natural conditions, excited by mental contagions, in the same way as physical derangements are excited by physical contagions. Despiné, of Marseilles, who in many respects may be compared with his great master, Esquirol, has followed this line of study with wonderful success, and has given to us a history of moral contagion which claims the attention of every social scholar. For my part, I like and approve of all that these teachers teach, except the term they use to set forth their argument. I prefer the term mental contagion to that of moral contagion. Moral contagion I cannot conceive as conveying any sense of variation from a standard health of the mind, and any contagion moral in its nature would to me indicate a contagion that was good, and contrary, in its nature, from the idea of contamination usually connected with the word contagion. I choose the term *mental contagion* as being more to the point, and will, therefore, study this division of our subject under that title.

The unhealthy mind affected by mental contagion presents itself, when it is carefully observed, over a much more extended field than is generally supposed. It affords, in fact, a representation of a series of phenomena so widely spread that its very extent is a cause of its obscurity: we are so familiar with it that we do not recognise it; we are so familiar with its results that we come to look on them as occurrences sufficiently common and natural to be unavoidable. It is only when we are critical in our analysis that the obscurity begins to pass away and the characters of the phenomena appear in all their clearness and extensiveness. When these phenomena are recognised, it is astonishing how contagious affections of mental origin are seen to resemble in their course those arising from simple physical contagions. Sometimes they take a spreading or epidemic character, after the manner of the so-called catching diseases with which we are most familiar, and are seen to widen into great epidemic outbreaks, extending over large tracts of country, and causing the strangest of effects known in history. One of these marvellous outbreaks of mental contagious diseases, not to name any more, was the dancing mania of the 14th century, during which, assemblages of men and women who had come out of Germany to Aix-la-Chapelle, united by one common delusion, formed circles, hand in hand, and, appearing to have lost all control over their senses, continued dancing, regardless of the bystanders, for hours together, in wild delirium, until at length they fell to the ground in a state of utter exhaustion, panting, senseless, and labouring for breath, yet not infrequently rising, after a rest, and continuing the motion until, in many instances, they died from the effort. At other times these outbreaks from mental contagion, in which one victim has followed another, has taken what, in regard to more ordinary known diseases, is called the sporadic form—that is to say, has been developed, or has broken out, in some particular locality, and has not extended beyond the boundaries of the locality. An outbreak of a convulsive type, arising from fear, once occurred at a manufactory at Hodden Bridge, in Lancashire, in which outbreak over twenty persons, taking the contagion from one individual, were attacked most severely, but without communicating the affection beyond the place where it broke out.

Like the common contagious diseases, these diseases of mental contagion have been known to have their seasonal proclivities. The ordinary spreading diseases, such as measles, scarlet fever, cholera, typhus, have each their favourable seasons of intensity and decline—their maximum and their minimum periods. It is the same with the affections of mental type which spring from contagious influences. In the Shetland Islands a contagious mental affection, which was ultimately cured and prevented by moral means alone, broke out in the year 1817, during the summer months, and recurred every year during the same months until it was finally disposed of. In like manner suicide—which may be looked on as a distinct form of mental disease—is of so contagious a character that, during the reign of the first Napoleon, the sentry-boxes of a station had to be burned, because one soldier, having set the example of hanging himself in a sentry-box, was followed by a large number more. Suicide also has its season of height and decline, its maximum being reached in June, and its minimum in February, like a true epidemic.

Another singular and important characteristic quality of the contagious mental disease—one of immense importance to remember, and one which links their phenomena very closely with those of the common contagious diseases — is what may be called the line and order of their development and decline. The common contagious diseases usually commence from a single point, rapidly increase in intensity, and then decline, often as suddenly as they have come on the field. The same is seen in the contagious mental diseases. Despiné illustrates this very cogently from the contagion of the duel. At first, he shows it is necessary to have some great cause to raise the disease of mind which leads to a first contest of duelling. But let the contagion go on, and soon the merest pretext is sufficient to excite the phenomenon, until at last it ceases altogether for the time, as if it were worn out by its own excessive fury and folly.

That I might bring out in strong relief the contagious acts by which the health of the mind may be affected, I have cited strong instances, some of which may be considered as belonging rather to a bygone than to the present age. I admit the fairness of the criticism, but the lesson, unfortunately, remains. The student of the present need not go back to the past in order to find examples of mental contagions which are as injurious, directly, to the mind as they are injurious, indirectly, to the body. Those strange phenomena of movements of the limbs which are excited, in susceptible children, from imitation, are of this class; and the still stranger phenomena of hallucination and spiritualistic manifestations are of the same contagious order, and are so contagious that whole masses of people may from one case, itself suddenly developed, be affected by an epidemic visitation which shall have its period of maximum intensity, and then, the epidemic influence withdrawn, shall sink to a minimum, and for a time cease altogether.

It is deserving of remark, before I bring to a close the present section of my discourse, that sometimes the physical and the mental forms of disease run together so intimately that it is difficult, even for the skilled observer, to distinguish between the one and the other. The fact here named is conspicuous during the existence of the outbreak of the alarming disease, Asiatic cholera. The intelligence of the phenomena of this malady poured into the impressionable mental organism, with all the tragedy of detail and circumstance of fear, is of such telling force, that symptoms of the fatal disease may be introduced by the senses, and implanted with so strong an imitation as to make the distinction between the imitative and the actual disease a puzzle even to the practised observer.

MENTAL SHOCK.

The mental health of man is much affected by mental strain or shock. In this respect man stands alone in the world of life, separated from the lower families by his higher mental organisation. The difference is one which is not altogether in his favour, and which is very distinctive in respect to him. He shares with the animal world generally in regard to the influence of the animal appetites on his physical nature. He shares with many of the higher classes of animals in regard to the influence of fear, rage, jealousy, and those faculties which we call the passions. But he is subject to other influences which come all but exclusively to himself, which come to him through his mind, and which are felt through his peculiar moral, intellectual, and habit-forming characteristics. More than this, he possesses what other animals do not possess, a special gift of foreknowledge, which causes him to be affected by the anticipation of what is to happen, or what may happen, which anticipation may be to him as severe as the actual occurrence of that which is anticipated.

From this cause man is subject to what is called mental shock, and, as a consequence, to whole trains of disturbances of mind, extending often into the body, which in the most learned works treating on the affections of the lower animals are unrecorded, and which, even in learned works treating on man himself, are recorded with too little care. To observe that a human being has fallen into disease from the effects of a wound, a stun, or loss of blood, is common enough. Volumes are written on such events and their after effects; but to consider the mode of injury by an influence that shall penetrate by the senses or windows of the mind that were too refined and indefinite a task.

Yet this effect of shock on the mental constitution, one of the most potent of all influences on man, mentally and physically, becomes an influence which increases day by day with the increasing intelligence of the race. An uncultivated, all but animal human family, possessing the appetites as its leading pleasures, and having few other qualities higher than emotions resting on the appetites, may be so near to the animal world that few other beyond the grosser physical agencies affect it. But in a higher development of civilisation these positions of mind and body are so extremely modified that impressions telling through the mind become rapid, powerful, and persistent, until at last they may be predominant. The mind begins to rule; the body, now more subservient to the mind, grows up more susceptible to mental pressures, and the diseases developed in it, partaking of its own susceptibilities, are brought out more decisively by and through the mental impressions it receives.

So on civilised man the effect of sudden shock is of serious import. The rougher natures, even of this day, laugh and jeer at those of refined nature who are affected by what to them of ruder nature seem to be comparatively gentle perturbations. Between the highest and lowest civilisations there is thus a wide gulf, which is historical in its meaning, and which will remain historical until all the world is equally civilised, if such an event can ever be. Also, until such an event, remote as ages, is reached, the health of the mind, as influenced by shock, will be a topic for very careful sanitary study and lesson; a study increasing as civilisation increases, with this fact always to the fore: that excessive shock and strain might become so effective in action as to destroy the perfect mental balance of a whole people, and leave it naked to its enemies. For the influence of mental shock in susceptible subjects has this momentous fact about it, that it tells on every age of life, from the first completion of a nervous organisation to the final ending of it. It may become subdued in the latest stages of life, when the senses are getting dulled, and the mind is becoming *sans* everything; but in all preceding periods and stages it is in action. I recall at this moment a youth whose mental health is so disturbed by one particular series of vibrations acting on his mental organism, that though to other persons such vibrations are quite bearable, when they occur to him he is not himself. Yet the shock that implanted this perturbation on his mind was inflicted on him, through his mother, before he was born into the world. Nay, the shock may even go further back than that; it may be traced back for three or four generations. A person, strangely and terribly affected, was brought to me, suffering with an intense susceptibility to one particular impression, which, to ordinary minds, would be of no consequence whatever. To this person, this impression, whenever it came, was a bar to all mental health, and, by the effects secondarily induced, was a bar also to physical health. This phenomenal variation from health was not, I felt sure, a passing fancy or vapour, but was the recurrence of an ingrafted hereditary susceptibility to that one impression; an ingraft occurring originally under circumstances which were peculiar and, perchance, terrible in their nature. At first nothing could be remembered that would either negative or confirm the theory suggested. But a careful inquiry, passing through three generations, established the truth of the theory beyond doubt.

These phenomena, looked into, would be found to be of constant recurrence, and would account for many human conducts and events which now pass current as mysteries unfathomable. They are the mental echoes of the physical dead; old vibrations played on a new instrument. They account for those ideals of pre-existence which almost everyone experiences, and which, to persons gifted with the faculty of memory in an extreme degree, are often positive annoyances at times when affairs of current everyday moment are calling for earnest attention.

The effects of mental shock on the mind in causing permanent bad health of mind, are most easily inflicted in the period of infancy and early life—school life; of which let one illustration suffice. A gentleman, who for many years was under my observation as a confirmed mental invalid, a strong man in most respects, but utterly irresolute, and in the end of disordered mind altogether, acquired his mental disease from sudden distrust He had, in his childhood, an innate dread of deep water, and he had, at the same time, a tutor, for whom he held the warmest affection, coupled with the most absolute trust and confidence. In a thoughtless and unhappy moment, this tutor became possessed with the idea that he would break his pupil's dread of deep water by pitching him into a pool, in which they were accustomed to bathe together, at the deepest part. There was no actual danger, for the depth was really not great, the pool was calm, the boy could swim a little, and in an instant the tutor, a strong and skilful swimmer, was in the water himself, rendering succour and support. The lad was brought to shore safely enough, but the mischief to the mind was inflicted beyond repair. The surface of trust was obliterated, and a fixed distrust in the mind of the youth was set up for ever. If a skilful physiologist could have discovered the seat of trust in that youth, and could have destroyed it mechanically, he could not have inflicted a more severe injury, nor one more determinedly lifelong in its effects.

PERVERTED APTITUDES.

It falls to every mind to be influenced by its surroundings, to be affected by mental contagions, to be subjected to shocks and sudden strains, and to be affected in its health by all these influences; and now I proceed to notice that there are other modes by which the mental health is affected, modes determined by what may well be considered as perversions and diversions from the particular aptitude for particular work of the mind.

At the present period of time no subject of study whatever could be more important to us as a nation than this subject.

To understand these perversions and diversions from the natural mental aptitudes, it is necessary to know the mental constitution as it is divisible into its major parts: the appetites, including the passions; the emotions, including the sentiments; and the reason, including the intellectual faculties, judgment, or the weighing of evidence, knowledge, or the accumulation of observed facts, and, wisdom, or the balanced application of knowledge of all and various kinds. These are the three mental primaries constituting the three lives of men; the animal life, the emotional life, and the intellectual life.

In every man these mental lives exist, but in different degrees and in different combinations. In one the animal nature so prevails that he passes as animal; another is all emotion; a third is cold, thoughtful, hard. The members of the marked animal type are not, as a rule, of long endurance, but while they live they go through everything — through pain, through physical work, and even through drink and Bohemian fury, with exceptional facility. To intellectual eminence and distinction they never rise by pure mental capacity, but they are often rendered famous by deeds of strength or animal skill, whilst now and then, by some *jeu d'esprit*, they gain an admiring auditory, and secure a large following of men after their own heart. The members of the emotional type are, also, not of long endurance, but, keen, over earnest, and led by impulses which appeal at once to natures like their own, they light up conflagrations of controversy. As men, they constantly lead with them hosts of the gentler sex, by whom they are much admired; and, not infrequently, they win, for a time, marked successes which, to colder intellects are mere passing victories, to be forgotten before they are fully realised. The members of the pure intellectual type are enduring though rarely great men. Work does not injure them either by its penalties or its pleasures; they are not rough, for they have no animal rudeness; they are not sympathetic, for they are deficient in emotional surface; but they reason well, and, judging of men and things calmly, wait for the progress of events, bring into play whatever powers they have with precision, at the proper season, and, caring little whether they gain or lose, for all things are alike to them, remain simply as wise men.

I sketch out here the primitive types of men as they exist now, and as they have existed ever since the first descriptions of men that can be gathered from reliable history. But there are combinations of these, as there are changes of peals of bells. There are they who are of animal and emotional combination; not a desirable combination. There are they who are of animal and intellectual combination, men of tremendous power, who can fell a tree or govern a nation with equal facility, men whose animal faculties quicken and feed their intellectual, and in whom the opposites of their nature act as foils the one to the other. There are others of emotional and intellectual combination, men bright and good by nature, who lend themselves to everything that makes life pleasant, who are both courted and trusted, who sympathise and philosophise; men whom everyone who has the chance invites to dinner; whom the societies and academies run after pell-mell; whom the philanthropists lie in wait for; who are the dilettanti of literature, art, and science; and who are splendid patrons, whatever else they may be. And, once more, there are the men of equally balanced combination; who, creating no enthusiasm, are looked upon with equal respect by friends and opponents; men whom everyone would like to have as referee in cases of dispute; or as trustee at the crisis of making a will under urgent pressure.

In drawing out these pictures of mental surfaces, I have followed Othello's advice; I have extenuated nothing nor set down aught in malice; my object being solely to indicate that amongst these different minds the health must needs be influenced by the external vibrations which keep the mind going, in a form and manner peculiar to each, as a mind in each case working by its own mould, by its own anatomy, under every impression from without to which it is subjected; differently in different persons even from the same impression; sometimes evenly, sometimes vehemently, and sometimes like sweet bells jangled out of tune and harsh.

Let us think for a moment of the almost necessary results of ignorance on this truly vital theme. A man of a hard intellectual type sets up for a whole family of learning children a standard of learning like that which he himself approves; sets up what he expects all other minds to conform to. As a result the tenderest faculties of the children, faculties, perchance, which, if they are to be utilised at all, would require to be brought out in the gentlest manner, are literally obliterated. The mind of the child is as clay in the hand of the potter. Yes! But the skilful master, he who turns out the finest work, is he who knows his clay, knows his mould, and knows where lightly and where firmly to touch, and shape, and shear.

Later on in life, when youth is being sent forth on its destined career, this same error bearing on the health of the mind is perpetrated with as grievous carelessness as ever. Comparatively few youths would, I think, go wrong in the careers in which they are sent forth if their mental facility for that which they are expected to perform were correctly gauged. A man who is colour-blind is, by necessity, prohibited from taking charge of railway signals; yet over and over again we see youths whose emotional natures are quite as strong a bar to some calling or profession—such a profession as mine, for instance—forced into the selected profession, to endure a martyrdom for life, with not one moment of chance for distinction, or for anything more than the qualified performance of duties which are a daily cross and a daily sorrow. Such men take sometimes to what are called bad courses, become intemperate and forfeit confidence: towards whom let pardon have a fair place, since the primary error is not their own.

These mistakes which mature men and women inflict on the young are bad, but they are not worse than the mistakes which the mature often inflict on their own maturity. Men knowing nothing of their own mental constitution, and thinking nothing of their own mental health, throw themselves into mental strifes and contentions, for which they are mentally as little fitted as they are physically fitted to remove mountains. One man, with his animal life worn out by professional or business labours, determines to close his honourable career by undertaking senatorial duties which call for mental animal work of giant power. Another, whose emotional mind—always the master of his intellectual part—has led him constantly into serious scrapes and difficulties, permits himself to enter into contests in which the whole argument turns on sentiment, and breaks himself to pieces in the struggle.

The subject now touched upon is so fruitful of suggestion and illustration, I fear to follow it further, lest I be forced thereby to leave out some other matters bearing on the health of the mind which could not properly be left untouched. Suffice it now, therefore, to say that the study of mental aptitudes becomes a part of the study of every sanitary scholar. To the man who is a sanitarian it is of first rank; to the woman who would make good health the choicest garment of good life, it is beyond compare, because in the early days of life the diagnosis of the human mind is so distinctly her task. The man, the father, brings the food, the clay; the woman, the mother, sees how the clay is moulded, and moulds it anew.

MENTAL OVERCHARGE.

If too sudden and extreme an impression be made on the mind, there is commonly a start or a convulsive movement. That is overcharge, the surplus of vibration cast from the mental into the muscular organisation. The motion which looks so alarming is the relief. If there were not that means of relief the vessels of the brain might break, or the heart itself might burst. Sometimes when these parts are weakened they do give way, under the shock, and "stroke" or "syncope" brings the life to a close. These are the major overcharges of the mind declared visibly through the body. But, short of these, the health of the mind is too often injured by the effect of minor overcharge, arising, not from sudden vehement shocks, but from little shocks leading to long-continued pressures, which kill the mind in parts or centres or altogether. By this latter process of overcharge the health of the mind is injured in our day to an extent that probably has never before been reached in our national history. Our schools at the present moment are engines of unprecedented power and skill for effecting mental overcharge and all its accompanying evils. Our modes of life in periods of later life, our pressures of business, our struggles for wealth and notoriety, with health and true fame both at a discount, our flying visits hither and thither over the whole surface of the earth without exploring it, our cravings for mental stimulations of every kind and quality, our resolute desire to try once more to scale heaven that we may tear aside the veil that conceals the infinite;—these overcharges of mind are momentous in the present crisis of the civilised world. If some of the grosser appetites are reduced, the emotions are more wildly aflame and the reason more at bay. The passions are rising in mighty waves, and the brain is becoming like a troubled sea. Love staggers before hate, jealousy outrides fear, and assurance in equality of mind is so strangely assertive that, at the rate we are now going, no man will have a chance, ere long, of being remembered for what he has achieved, save the man who has stunned the world with the record of the most hideous possible crime. Yet, with it all, there is the gleam of hope that, with knowledge so advanced as it is, there will be developed a more reasonable desire to temper knowledge with wisdom, and to bring the passions, now so wild and furious, into subjection to reason.

It is towards methods of teaching that shall lead in the direction of reform in all conditions which affect the health of the mind, that the study of the mind becomes now a part of the duty of the true sanitary scholar. For, let me observe, that to neglect the mind is also to neglect the body itself. Under our sanitary skill great plagues are being swept away, and by that sweeping, our death rates are coming down to a figure that is a marvel to the world at large. 'Ah!' says the enthusiast, 'see you the prophecy is at hand': "there shall no more be an infant of days nor an old man that has not filled his days;" 'for note how the young are ceasing to die, and how the old are continuing to live.' It is true, and yet the millennium is not in sight. "For observe," say those of us who are on the watch-towers, "observe how diseases of nervous origin, in other words, of mental origin, diseases like diabetes and cancer, and some forms of insanity, are on the increase! Observe, too, how the social storms, always so mortal when they set in, are showing their premonitory signs in every quarter. There is less death; there is more life. Is there less disease of the mind as well as of the body?" That is the question.

And where shall the question be best tried? What is the proper time, what the proper place for putting it to the test? What time better than the present, when health is a popular theme; what place so good as that in which health is most advanced, some place famous for health and its resources? Adapting the argument to the present time and place, when and where could the work begin more appropriately than now and here? We meet for the encouragement of health; we meet to consider and discuss the greatest subjects connected with that absorbing subject; we meet to listen carefully to papers and debates by learned, earnest, and practical men; and we have erected and furnished a beautiful exhibition building as the outward and visible sign of the practice as well as the spirit of our endeavours. Could we have a more fitting starting time or point? Is it possible to find one more excellent? Let, then, Hastings-St.-Leonards-on-Sea—for it is now one place, and will, I trust, from this date have one name—let Hastings-St.-Leonards-on-Sea, already so famous as an abode and centre of health, hold and keep the lead, not only in the matter of bodily, but of mental salubrity. Suppose Hastings-St.-Leonards chose to continue in that course, and that we could see her in a hundred years to come in all her acquired strength, and purity and beauty? The transformation would even be greater than the present from that town of a hundred years ago, which Mr. Cole, in his excellent little work written for this Congress, tells us Dr. Matthew Baillie discovered as the site of a resort for those who required for health, not merely the open breezes of the sea, but beauty of scenery, and a climate so adaptable to season that different climates are included in one locality. In that transformation we should see a town of exquisite beauty, open in every part, and pure as the breezes from the surface of its ocean. Physically, all would be beautiful, the simplest, poorest home, the home of cleanliness, and good taste, and good bodily health. And mentally, how marked would be the change! Every one of those fine and noble arts which, in their best form, exalt a nation, would be of the truest and healthiest. What we now call chaste and good, how much more refined it would be! A drama, in which the history of the world, past and present, would be represented in such form, that to every child it would be a school of mental health; academies of painting and sculpture equally instructive and equally pure; academies for ordinary teaching, in which learning and happiness, properly combined, would save the young from all the hazardous and shameless shocks of competition and cram which are at this moment so great a peril, shame, and disgrace; amusements which would bring out both bodily and mental powers, and in which members of both sexes could alike take part with like benefit; and, a literature so chastened, however powerful it might be, that the author who dared to present a work less spotless than the surface on which his thoughts and words were impressed, would not be permitted entrance into the school, the house, or the library. This, with much more of mental and physical health, is what Hastings-St.-Leonards may, and I believe will become, as time wears on, as the thoughts of men widen, and as the value of health rises in public estimation. But whether the grand progress be greatest in this place, or in some other, it is our duty to be the heralds of it, and do our best, our utmost best, to add to days of life :—

> " The richest bounties of indulgent Heaven,
> Truth, goodness, honour, harmony, and love.'

SANITARY LEGISLATION,

By WILSON NOBLE, Esq., M.P.

Sanitary Legislation is at once the most ancient and most recent. On the one hand, it goes back to the Mosaic, the oldest code of laws we possess, and though at that time law-making as a science was unknown, and so *a fortiori* was Sanitary Science, yet so important was Sanitation considered by the Divine Law Giver, whose spokesman Moses was, that He laid down sanitary regulations in language most clear and definite, impressing upon us most forcibly the truth of the adage that "Cleanliness (the essence of Sanitation) is next to Godliness." We find the most minute and detailed instructions given as to the observance of cleanliness, both in the individual and in the community, in order that the health of the people may be preserved. We learn, too, that persons suffering from that loathsome disease, the leprosy, were for a time cut off from Israel, and not allowed to return to the congregation until they were purified. And to impress more strongly upon the patient the necessity of cleanliness, we see him being told to wash seven times in Jordan.

Those who have visited Rome must have been struck with the magnificence and grandeur of the ruins of the Roman baths, though, perhaps, it is a question whether they were built so much for sanitary purposes as for the purpose of luxury and enjoyment. But whatever may have been the origin of those baths, it is obvious that the Romans paid particular attention to cleanliness.

Within what may be called, comparatively speaking, modern times, we find death prowling through our crowded cities, and even our country lanes, striking down with one hand the strong man in the prime of life, and with the other the woman and her little child; unchecked and unheeded, because the people did not know the cause of his coming, and consequently were unable to take precaution against his ravages. We have to ask if we are making progress? A few figures will, I think, show we are. The death-rate per thousand in the years :—

1660—79 amounted to 80.
1681—90 amounted to 42·1.
1746—55 amounted to 35·5.
1846—55 amounted to 24·9.
1871 amounted to 22·6.
1887 amounted to 18·8.

In London, in spite of its size and densely-packed population, the death-rate is only 19·6. It is, however, to the present century that we must look before we find any serious steps being taken on the part of the Legislature to insist upon more sanitary conditions being established.

It is not my intention to recommend any particular legislation, because I do not wish to enter upon any matter of a controversial nature, as the President's addresses at this Congress are not subject to discussion. I think I shall better fulfil the duty which I have been called upon to undertake if I limit my remarks to a brief historical summary of past and present legislation, considering the defects in our present system, and inquire how far it is possible to remedy them. Now the chief requirements of health are :—

1.—Water supply, pure and plentiful;
2.—Fresh air circulated by ventilation;
3.—Removal of sewage by adequate drainage;
4.—General cleanliness.

How far have these been insured by legislation, and can we look to legislation to insure them in the future?

Before you can expect Parliament to move in the matter, you must show that these things are necessary. The great obstacles to sanitary improvements are ignorance and poverty. I do not mean to imply that these are synonymous terms, so as to make them to appear as one cause, but as two entirely distinct causes of insanitation. In other words, I do not mean to imply that the poor are necessarily ignorant. As to the removal of the first of these obstacles—ignorance—it is being rapidly dissipated. We have, fortunately, within our midst many men who have devoted their lives to sanitary science: men who are daily educating us, and showing us how we may make our towns healthier, and our houses more wholesome; and, consequently, how we can prolong our lives, and protect ourselves against sickness and disease. These men are striving to attain a definite goal—the amelioration of the mental and physical condition of mankind. At present the death-rate throughout England is 18·8 per thousand. Looking back a hundred years, this is a very considerable reduction. Though we have been able in the last two decades to reduce the death-rate about 4 per 1,000, this reduction implies a greater progress than the figures will at first sight warrant. It shows that we possess a greater power of contending with the forces of disease than we had in the past, because the natural causes of insanitation are on the decrease. There is a strong tendency for people to congregate in towns, owing to the necessity of finding work. If people, having reached the towns, were able to find clean, healthy, and roomy dwellings, the result would not be so detrimental to health, as it is not the size of the town which produces insanitary conditions, but the density with which the population is packed. If, therefore, we could increase the areas of towns in proportion to the increase of population, we should very materially reduce the tendency to sickness, and consequently the death-rate. But, unfortunately, the bulk of the people who flock into the towns go there for the purpose of obtaining work, consequently producing all the evils of over-crowding, about which I shall have something to say presently. Therefore, though the death-rate throughout England continues slowly to decrease, yet the progress of Sanitary Science is rapid; though the workers are few, yet are they earnest and energetic? They are daily acquiring knowledge, enabling them to cope with the ever-growing causes of disease, and they as rapidly distribute it; and if more towns were to hold Congresses similar to this, where the people would have the advantage of learning what is necessary to the requirements of health, and at the same time instructing us who are in Parliament, and showing us where our responsibility lies, we should more rapidly reach the haven for which we are steering.

This can, however, only be done by perseverance and patient labour, by allowing no prejudices to interfere with progress, but by believing that those who have devoted their lives to a particular science must at least know as much about it as those who have persistently ignored it. So much for the removal of ignorance, which, I trust and believe, is but a matter of time. As to poverty, that cannot be so readily removed; the poor we have always with us, and always shall have, so we must endeavour to ameliorate their condition. They are largest in numbers, and consequently, the greatest sufferers, and are surrounded by more unhealthy conditions. It is true that at one time there were advocates of the Malthusian theory, by which it was hoped that death from disease would remove the surplus population in over-crowded districts. I say "were," because I believe very few of its advocates exist at the present day. Pestilence, as a check on population, has now been proved to be no check at all, for, instead of reducing population, it merely leaves it more sickly and enfeebled. In unhealthy localities, such as the slums of London, where epidemics run wild, the usual interval between births is one year, against two years in the more healthy agricultural districts, owing, no doubt, to the fact that in the latter case the mothers nurse their own children, and in the former they do not. This increase in the birth-rate, therefore, compensates for the increase in the death-rate, the nett result being that the unhealthy condition of a locality does not reduce the population.

I am inclined to regard the dwellings of the poor as one of the burning questions of the day, and one which demands our serious consideration, both on account of its importance—not to the poor alone, but to the whole community—and because it is, at the same time, one most difficult to solve. Those who have studied the report of the Royal Commission on the Housing of the Working Classes will, I think, wonder not at the high rate of mortality in our large towns, but at the comparatively low rate, considering the awful condition in which some of our people live.

Lord Shaftesbury, who spoke with sixty years' experience, said that however much the condition of the poor had been ameliorated in other respects, the over-crowding was becoming more serious than ever. In some parts of London, as in the neighbourhood of St. Pancras, over-crowding had not increased, simply because the locality was so full that it could hold no more. In many parts it is unusual to find a family occupying more than one room. Until the report of the Commission was published, very few people had any idea of what was taking place within a mile of their own doors. In one case we find a family of nine persons, five of whom are grown up, occupying a room 10ft. by 8ft.; two families in one room 12ft. by 8ft.; seven persons in a room 12ft. by 6ft., and only 7ft. high; a father and mother are found occupying a room 10ft. by 5ft. with four children. Over-crowding also exists in provincial towns, and, though in some places extremely bad, cannot compare with London in its worst parts. In Newcastle-on-Tyne, 140 families were found in 34 houses, each consisting of four rooms and two cellars. In another case 50 houses with 230 families, and in another 62 houses—310 families. Instances are given at Camborne, in Cornwall, where seven, eight, nine, and even 10 and 11 persons were found living and sleeping in one room. In Birmingham another kind of over-crowding was noticed before the improvement schemes were carried out; that is to say, of crowding a large number of houses on to a limited area, the rooms of the houses not being occupied by excessive numbers of persons. Over-crowding is invariably accompanied by other evils injurious alike to health and morality, such as structural defects, bad drainage, and bad ventilation; but setting these aside for the moment, over-crowding has been found to be injurious in itself. Sir Edwin Chadwick has shown that there was an excessive death-rate in single-room tenements, a lower death-rate in double-room tenements, and a still lower rate in three-roomed tenements. In parts of London it was found that even where there was no outbreak of epidemic, the death-rate in one case was 44·4, another 53·7, and in another as much as 70·1 per 1,000.

As has been pointed out, over-crowding is an ever-growing evil, because the causes which produce it are ever on the increase, and themselves are productive of fresh causes. We have first the general migratory tendency towards the towns. The workman, having reached the town, is compelled to be as near as possible to his work, or if not in regular employ, to be in such a neighbourhood that he can readily get to work should any offer itself. Sometimes work may be obtained provided the workman can get to it by six o'clock the next morning. A colony of poor beings thus formed, it is necessary to feed them. The usual shops are too expensive, by degrees are closed, and become occupied by other families, and costermongers supply the necessaries of life more cheaply than the shopkeepers, and, in their turn, add to the evils of over-crowding, for they are bound to live near the place where they find a ready market for their goods. Then the houses become old and dilapidated, and have to be removed. A Street Improvement scheme is floated, and scores of homes are demolished—not one moment too soon—but, unfortunately, while the new homes are building, and the streets being opened, the poor are still more densely packed in the remaining houses. Though the building improvements no doubt confer inestimable benefit on the locality at large, yet while they are in course of progress, they inflict most cruel hardships on the poor in the immediate neighbourhood. Nor is this the whole of the evil. The dwellers in these crowded parts become enfeebled by sickness and their poisonous surroundings, and are unable to do the same amount of work that they could do when they first came to town. The contractors consequently advertise for men from the country, who, fancying the demand for labour is greater than the supply, flock up to town with their families to obtain work, thus adding to the already too dense population, and in their turn becoming sickly and feeble, only to be replaced again by fresh supplies from the country.

The people being obliged to live near their work, they are compelled to pay almost any rent demanded, and this precludes the possibility of their occupying, in many cases, more than one room. The rents, too, are increased by the middle men—the freeholder often having but slight direct interest in the welfare of the occupiers. He, the freeholder, usually inserts clauses in the lease compelling the tenant to keep the house in repair, but he often is unable to insist upon these repairs being carried out, because he knows that if he did the already exorbitant rent charged by the middle man would be still further increased. That the rents charged are exorbitant may be seen from the fact that some of the middle men—or house jobbers, as they are called—obtain as much as 150 per cent. profit. I do not wish to discuss the breaking up of the large estates which is advocated by some as a remedy for these evils, because the question of the enfranchisement of leaseholds is a current political topic. I think, however, it should not be forgotten that someone would have to be landlord, the poor being unable, in most cases, to own their own houses, and it is a question whether overcrowding would be reduced by replacing the large landlords by the present middle men. Among the accompanying evils of overcrowding may be mentioned insufficient water supply, bad drainage, bad ventilation, and structural defects. In many of the large tenement houses there is a single water supply, which, not being constant, is drawn off at certain hours of the day, and kept in tubs in the sleeping rooms; or if there is a cistern, it is often outside in the sun, and uncovered. Those who travel to town may often have noticed the open cisterns in summer covered with green growth of rank water slime, which, if examined, even in the most careless manner, would be found to be teeming with animal life. This water, when it holds out, is used for drinking and all domestic purposes. One very necessary reform I hope we may shortly see carried out is the purchase by the localities, Metropolitan and Provincial, of all Water Companies—a constant supply being enforced, thus abolishing cisterns, which are more often traps to catch any passing disease than containers of pure and wholesome water. But the water supplied *must be* pure and wholesome, for there is no more ready vehicle of disease than water. It has been shown over and over again how epidemics have arisen from contaminated water. Very frequently it is drawn from a well near a leaky cesspool or drain. Persons have taken typhoid fever when contaminated water has been used for washing milk cans. As water is such a willing carrier of disease, the fact should be utilised for our advantage, and not to our destruction. As science grows, our power, not of controlling, but of utilising, the laws of Nature increases. Our present knowledge enables us to use it to our advantage by conveying all impurities from our houses, and yet, for the most part, we only allow it to bring them to us. It is within our power to obtain pure water; let us have enough of it to carry off to the sea or into the porous earth—which is an equally effective purifier—all our refuse and dirt. But the source of water must be plentiful and pure. Nature grants us this, but again we have abused her gifts. Look at our great rivers, and contemplate what they were and what we have made them. We have means to-day of distributing sewage over the face of the earth, where it was by Nature intended to be placed, to nourish and improve the growth of the plants we require; instead of this we pour it into rivers where it is washed backwards and forwards by the tide, contaminating the water, and not only making it absolutely unfit for use, but converting the river itself into an open cesspool. I venture to think that there are many less useful questions brought before Parliament than that of the disposal of sewage and the purification of rivers. Air, as well as water, is essential to the well-being of the community, but the air must circulate, or it soon ceases to be pure. It is, however, not my province to dwell upon any particular methods of ventilation, even were I competent to do so, except so far as the action of the Legislature may prevent or assist the access of air to dwellings. Air is the common property of mankind, and no one should be allowed to deprive his neighbour of it by the erection of buildings in such a manner as to cut off the supply. By the Building Acts, every house is obliged to have a certain amount of air space back and front, but in many cases these regulations are wholly disregarded. Houses are built back to back, or are separated by narrow alleys, the centre of which is often little better than an open drain, into which the filth from the houses is thrown, contaminating the air before it reaches the windows. Air, like water, is a great destroyer of impurities, and consequently a powerful deodoriser. I remember an old friend of mine, in the medical profession, saying that the chief use in disinfectants was that they made such a smell in the room as to compel persons to open their windows and admit fresh air. Structural defects, too, are often the cause of much sickness. It too often happens that houses are built of the commonest materials, and put together with the worst workmanship. The drains very shortly become leaky and dangerous, and the houses, even were they not overcrowded, would be wholly unfit for habitation.

Having glanced at some of the causes of insanitation, let us consider how the law stands with regard to it. The Factory Acts passed in 1833, and amended in 1834 and 1844, were social reforms, but I think it would be unjust on the part of sanitarians not to acknowledge the benefits to health which they brought. They regulated the hours of labour of women and children. They were extended again in 1867, 1870, and 1878, and consolidated, as we know, in the Act of 1883. The Mining Acts had a still more beneficial effect upon the health of women and children employed. If we look back at the terrible condition in which Wilberforce and Lord Ashley, as he was then, found these women and children, all, I think, will admit that they had a most important bearing on health. Women were found dragging trucks of coal through the seams, being literally reduced to the state of beasts of burden, and, in consequence, becoming, as far as possible, unsexed. I will not, however, dwell upon these Measures, as they affected persons engaged in a particular employment, rather than the community at large.

In 1846 we find Parliament recognising the importance of cleanliness by passing the Baths and Wash-houses Act, empowering the local Authority to establish public baths and wash-houses. And about this time Acts were also passed for the removal of nuisances, but these Acts were consolidated and amended by the Act of 1855, which, in its turn, was extended and amended by the Sanitary Act of 1866. By this Act accumulation of dirt near dwellings, defective drains and cesspools were dealt with, and houses which were found to be so overcrowded as to endanger the health of the neighbourhood were to be regarded as nuisances, and removed under certain conditions, to which I will refer later. These several Acts were again consolidated and amended in the general Sanitary Act of 1875. Two other Bills were introduced in 1866—one by the Government, which was passed, giving power to the Public Works Loan Commissioners to advance money for the erection of labourers' dwellings in populous places; the other, a "Bill to provide better dwellings for artisans and labourers," introduced by Mr. Torrens, was far wider in its scope than the Government Measure. It, however, was not passed, but referred to a Select Committee, the outcome of which was the well-known Torrens' Act of 1868, amended in 1879 and 1882. The Torrens' Act was followed in 1875 by Sir Richard Cross' Act, and until 1885, these were the two chief Acts upon which the regulation of insanitary dwellings depended. By the former of these the responsibility of maintaining his house in a proper and wholesome condition falls primarily upon the owner, and in the event of his failing in his duty, the local Authority is entitled to step in and compel him to perform it. It also deals with houses and other buildings which obstruct ventilation, and so render the neighbourhood close and unhealthy. This Act, however, only deals with single houses or small groups, whereas the subsequent Act of Sir R. Cross dealt with large areas where the houses were inconveniently crowded, or so structurally defective as to render wholesale demolition necessary. Both apply, with certain limitations, to the provinces as well as to the Metropolis. The Cross' Acts are worked by the City Corporation and the Metropolitan Board of Works in London—or now by the County Council—and in the provinces by Municipal Corporations. It is set in motion by the Medical Officer, who reports that a district is unhealthy; then the local Authority passes a resolution that plans for an improvement scheme be prepared. These are laid before the Home Secretary, or the Local Government Board, according as to whether the locality to be dealt with is in London or the County. The local Authority is not to build, however, unless it is found impossible to induce local contractors to do the work. I think we may regard with satisfaction that this Act is in a great measure due to an able speech by one of the former Members for this Borough, Sir U. Kay Shuttleworth, who brought the matter before the House of Commons in the previous Session.

In spite of this, however, the unhealthy condition of the dwellings of the poor in crowded places was recognised as a glaring evil, and a Royal Commission was readily appointed in 1884. This was followed by the Act of 1885. It empowered the Sanitary Authorities to make Bye-laws for the inspection of lodging-houses, and the Local Government Board to demolish unfit houses, and it further imposed on landlords the presumption that their houses had been let in a sanitary condition, thereby making it a breach of contract for them to let houses in an insanitary condition. It also gave to local Authorities power to build labourers' cottages. It is, I think, a misfortune that the clause relating to the purchase of prison sites was dropped, but the Bill was introduced at a time when it was impossible for the Government to press forward contentious matter. These sites would have given the much-needed ground for the relief of over-crowding. The London County Council have power to purchase lands or houses for the erection of lodging-houses, which shall be under their own control. This is not a new provision, but it has been greatly restricted in the past by the exorbitant compensation demanded. There is now a Bill before Parliament, introduced by Lord Henry Bruce, to limit this compensation. There is, I fear, not much chance of its being passed this year, or in any year in its present form, as it is doubtful whether the House of Commons would sanction the principle that the contingent or prospective increase in value shall not be taken into account in deciding the amount of compensation to be given. It seems only reasonable and fair that the present market value should be given, and in ascertaining this value it is necessary to take into consideration the prospective value, for unless this is done, you are really giving a man less than the market value, *i.e.*, less than the property would fetch in open market. What takes place now is that a man who overcrowds his houses, and so obtains a higher rent than the property justly returns, bases his claim upon this rent, and gets more compensation than one whose houses are not over-crowded. It is this which the Bill seeks to remedy. Sometimes prospective value is claimed on the ground that the houses will be worth more when improved. I certainly would not allow any compensation in this respect ; it is compensating a man for his own neglect.

Under the Sanitary Act the Home Secretary can direct any police-constable to prosecute in the event of nuisances not being removed. This power, however, has never been exercised, and it will shortly be transferred to the County Council by Provisional Order.

There are many points in the Local Government Act which require consideration from a sanitary point of view. It deals, however, rather with the administration of existing Statutes than propounding any new principle. The London County Council can only appoint Medical Officers of Health for the purposes of the Cross' Acts, with the consent of the Local Government Board, though it can appoint its own Medical Officer, but under strict regulations as to their qualification. For the purposes of the Torrens' Acts, which, as we have seen, deal with single houses or small groups, the Vestries are still the local Authority, the Council only stepping in when the Vestries fail in their duty, forming, as it were, a Court of Appeal, to hear the complaints which the Vestries may sometimes disregard. It is to be hoped that when the District Councils are formed, they will supersede the Vestries if the areas over which they have jurisdiction are not too large. The relationships which exist between the County Council and its Medical Officer are naturally new. He will simply be a skilled adviser to the Council, and will have no administrative or executive functions. He may be precluded from holding any other office, or from continuing his practice, though he must be a duly qualified practitioner. After 1892 he will be required to hold a diploma in sanitary science, public health, or state medicine. The advantages of these requirements are clearly stated by Sir Francis Galton in a recent lecture before the Society of Arts :—

> These provisions are a recognition of the facts that the due performance of the duties of a Medical Officer of Health requires

an education in the science of preventive, as contradistinguished from curative medicine, as a preliminary to the proper sanitary administration of a district. The importance of this recognition is not to be measured by the effect of these appointments alone. The influence of such a provision will be far reaching, because it will bring before the educational establishments of the country the necessity of providing education for, and instituting examinations in, sanitary science, and for granting diplomas and certificates, and will thus accelerate the education of the public generally in matters of sanitation.

The Medical Officer of Health of the Union or District Councils will have to send their reports to the Medical Officer of Health of the County Council, whose duty it will be to collate, and submit them to the County Council in his own report. He will then be furnished with accurate information from all parts over which his Council has jurisdiction, and having this general knowledge, he will be able to consider the sanitary requirements of the whole. A portion of the salary of the District Medical Officer of Health is paid by the County Council, and if he neglects to furnish a report, they will be able to stop their contribution to it. The Medical Officer of Health will also advise the Council as to the pollution of rivers. The Rivers Pollution Act has hitherto practically remained a dead letter. This is due to the fact that those whose duty it has been to maintain the purity of our rivers have, in many cases, been the chief offenders. The filthy condition of some of our noblest rivers arises from two causes:—(1) The discharge into them of refuse from mines and factories; and (2) the discharge into them of sewage water both in its natural and semi-purified state. In the first case there has often been a reluctance on the part of the local Authorities to take any steps which might be supposed to hamper an important local industry, and in the second, a reluctance to incur the expense necessary for the removal of sewage to a distance. In future, the jurisdiction of the County Councils will be over a much larger area, extending in many cases to the whole watershed, for several Councils may combine to form a Committee, and obtain under

Provisional Order from the Local Government Board the powers vested in the Sanitary Authorities by the Rivers Pollution Act. They will thus be beyond the influence of important individuals, who often have an interest in utilising the rivers as receptacles of impure matter.

The law, therefore, seems tolerably satisfactory if we regard its provisions and not its results. But it is to the results that we must look, and if we ask why they are not more satisfactory, we shall find that one reason is the indifference on the part of the inhabitants to the requirements of sanitary regulations. In London the Vestries and District Boards have had the power of appointing Medical Officers of Health and Inspectors of Nuisances, who are in no way subject to the Local Government Board, or any other public authority. Under the Sanitary Act, 1866, the Local Government Board was empowered to make provisions authorising the local Authority to regulate the number of persons who may occupy a house let in lodgings. This, however, is of no avail unless the local Authority is willing to make and enforce the regulations. It was lately found in London only two out of the 38 Authorities—the Vestry of Chelsea and the District Board of Works of Hackney—were taking any action under the Sanitary Act. As far as London is concerned, it is now hoped—and I think confidently hoped—that this supineness on the part of the inhabitants will disappear when the new District Councils come into being. It has already been seen that considerable interest has been taken in the election of County Councillors, and there is every reason to suppose that the same interest will be taken in the elections of the District Councillors. The indifference in the past has also been due to a certain want of appreciation on the part of the inhabitants of the necessity of sanitary regulations, but I would fain believe that this indifference, due to want of knowledge, is disappearing, owing to the knowledge which is being disseminated by Health Congresses and other means in various parts of the country. Though there are many sanitary defects which require removing in the provinces, they are not so conspicuous, except in some of the great centres of population, as they are in the Metropolis. This seems to be due to two primary causes. In the provinces the labouring man does not pay so large a proportion of his wages in rent; and because the Municipal Councillors are not elected in the same happy-go-lucky way as the Vestrymen of London, but on the contrary, are always under the eyes of their constituents. In the rural districts it has been found that in some cases the condition of the labourers' cottages has been very bad indeed. Where this is the case it is almost invariably due to indifference on the part of the landlords. But fortunately, here, too, by the example set on a few estates, notably Lord Shaftesbury's and Lord Tollemache's, the landlords are beginning to recognise their duties towards their labourers, and where the cottages have been improved, the experiment has been found to be a successful investment. But in the more crowded towns, both metropolitan and provincial, there exists one great difficulty. If you provide the people with a sufficient number of rooms to meet the requirements of decency and health, and if these dwellings are provided with the necessary sanitary conveniences; if, too, they are to be built in such a manner as to insure perfect ventilation and prevent overcrowding, one of two things must result. Either the occupier must pay more rent, or the builder or landlord, as the case may be, must forego his interest on his outlay. If the latter, the result will be that the houses are not built at all. On the other hand, can the working classes afford to pay more than they do at present? Under the present conditions, I think not, but under other circumstances, I think they can. We have already seen what an exorbitant profit the middlemen sometimes make. You can therefore do away with him, or place him under such stringent regulations as to prevent him letting lodgings in an improper condition. You cannot pass an Act of Parliament to say what rent a man shall pay, but you can enact that men shall not pay rent for dwellings that are unfit for habitation. We will suppose, then, that by means of legislation and inspection, we have places that are fit homes for the working man; can he afford to pay such rent as will give a fair return on the outlay, even though it should be higher than is at present paid? If we consider what he gains in return, we shall see that he can. Over-crowding and unhealthy dwellings produce debility, weakness, and exhaustion, rendering the poor particularly subject to sickness and disease. It has been found that at the lowest estimation every workman loses 20 days in the course of the year from exhaustion alone. Not only do those surroundings deprive a man of a certain number of working days, but they of necessity shorten his life. If, therefore, you can give a man such a home as to prolong the average span of life, you are surely giving him something that will be worth paying for. Not only does he gain strength, enabling him to work a larger number of days in the year, and so earn more wages, but you are also adding to the number of years during which he can work, and as you reduce the likelihood of premature death, so you reduce the premium of insurance. There are many items, therefore, in a poor man's expenditure which might most advantageously be devoted to a higher rent without increasing his expenditure as a whole. In support of what I say, I may perhaps be permitted to quote a most remarkable passage from Sir Edwin Chadwick's address to the Congress at Brighton, and I should like, in passing, to say how much I am indebted to his publications for many of the facts and figures I have made use of:—

> When I was examining the slums of Edinburgh I met an occupier of one of them whom I well remember. He was a strong, well-built man, who answered the questions I put to him with great clearness. He was a porter and earned more than 20s. a week. I asked him how he spent the wages he got, and he stated the details of his expenditure with apparent honesty. "But these only amount," I said, "to one half your earnings; what do you do with the rest of your wages?" "It goes in whiskey," he said. I could not help expressing my surprise and concern that so

sensible a man as he was should give himself up to such a course. "Well, sir, this is the only place I could get, and if you were to live here you would drink whiskey too." It so happened that whilst I was there I did feel a coppery taste in my mouth, a premonitory symptom from so depressing an atmosphere; and immediately I left it, it is the fact that, rightly or wrongly, I sought correction in a diffusive stimulant of warm brandy and water.

It may be said, and with great justice, that a working-man who is in regular employ might regard a higher rent for better dwellings as a good investment, but there are thousands below the regular wage-earner who have nothing to invest, and who cannot pay increased rent, no matter what advantages they may gain in doing so. In fact, often he can pay no rent at all. It is here where the real difficulty lies; and the question remains: to what extent are the Government called upon to find homes for these people? There are two alternatives before us. One is to do nothing; but this means maintaining in our midst a highly dangerous population. I am speaking, of course, from a sanitary, and not social, point of view. And the other is to provide dwellings out of the rates, or, at all events, to assist the building of these dwellings from the rates. This is only less objectionable than doing nothing, even if it *is* less objectionable. You increase the rates of those who do work for the benefit of those who do not, and often will not, encouraging them in their idleness, and consequently augmenting the very evil you wish to remove. This is the principle laid down by Sir R. Cross in introducing the Bill of 1875; he said it is unwise for the State to provide out of public funds the necessaries of life for any class of persons—and healthy dwellings are a necessity. But though it would be undesirable to erect State-aided or rate-aided dwellings, I do think some steps might be taken by Municipal or County Authorities, backed up by an Act of the Legislature, if necessary, to invest money in the thorough sanitation of rookeries and other places where overcrowding, and its unhealthy surroundings, become a danger to the community at large. If I regard this for a moment from a monetary point of view, as I have done in the case of the individual, it is not because I consider this its most important aspect, but I do so, first, because the advantages of promoting the health of the body politic are so obvious as not to need insisting upon, and to prove, if possible, to those who might object to any increased outlay of public funds, that they are not wasting their money, but investing it to a good purpose—that though they may appear to be casting their bread upon the waters, they will inevitably gather it again when they least expect it. It should, however, not be forgotten, as I have already pointed out, that County Councils have the power of erecting and controlling labourers' dwellings, charging such a rent as will give a fair return; but the enormous cost to them and the Trustees of the Peabody Fund have hitherto greatly checked their undertakings. It is very desirable that public bodies should be encouraged to build as much as possible, as they are naturally satisfied with a smaller return than a contractor who builds solely for profit.

I have it on the authority of my friend, Sir Lyon Playfair, that there are every year 125,000 deaths in this country from preventible causes. The investigations of Pettenkoffer have shown that there are 39 cases of serious sickness for every death; therefore we have annually four-and-a-quarter million cases of preventible sickness, and as these cases last on the average 18½ days, irrespective of the 20 days mentioned before, we lose annually more than 78½ million days' labour, which at 2s. a day represents a loss of over 7¾ millions sterling Surely, therefore, putting it on its lowest ground, it would be an economy to adopt sanitary measures, and an excellent investment for the localities to make. It is open to doubt whether you can appraise at any money value the life of an individual, but you may fairly compute money which will be saved by a proper outlay for sanitary purposes.

To show what has been done in the way of saving life where sanitary improvements have been undertaken, I may mention that after the defects in the sewage of Salisbury had been remedied, the deaths from phthisis fell 49 per cent., at Ely 47 per cent., Rugby 43 per cent., and Banbury 41 per cent. It is very desirable that we should have accurate and reliable knowledge of the deaths that occur from various causes throughout the country, and thanks to the Registrar General's Return, this knowledge is within our reach. But these returns are as yet not complete. We have realised the importance of having accurate returns of births and deaths, but there are other returns which are just as important to sanitary reformers as those of deaths, and that is, returns of sickness which may lead to death. At present we are completely in the dark. I have quoted the probable number of cases of sickness, but these are only an estimate which may be over or under the mark ; and I venture to think that if we could have an accurate return of sicknesses, we should be able to arrive at the cause of sickness much better than we are at present. I do not say who should be responsible for making these returns, but I do think they ought to be made by someone, and they should be universal. If a system of registration is put in force by localities, it not only loses a great part of its value, but there is also a reluctance on the part of localities to adopt it, because if one town—this, for instance—makes the return, it may be said that it is placed at an unfair advantage as compared with the neighbouring towns of Eastbourne and Brighton. It is thought that persons intending to come to this part of the country would ascertain that there is a certain amount of sickness here which they do not see in other towns, and so will go to these other towns in preference to this one If the registration, therefore, were universal, this objection would not arise, and we should obtain information which would be exceedingly valuable.

What we also want is a thorough and efficient inspection of dwellings and localities which are in an insanitary condition.

I have endeavoured to point out that the legislation is satisfactory, but that where it breaks down is in the want of knowledge obtainable. I know that too close inspection is repugnant to our feelings, but we often have to submit to things we dislike for the public good, and you can only remedy sanitary defects when you have knowledge of them, and this knowledge can only be obtained like other knowledge—by seeking it.

We are often told the Imperial Parliament is omnipotent, and can pass what measures it will. But there is in existence a code of laws which are older than the Parliament itself, which are more immutable than those of the Medes and Persians, which are inexorable in their execution, and which are enforced by the terrible sanction of sickness and death. These are the laws of Nature. You may make what regulations you like by means of your Imperial Parliament, but unless they are done in accordance with the laws of Nature, they are worse than useless. Nature is not a hard task-master, because her ways are clear and well defined. She does not act in one way to-day and in another to-morrow. You may repose the fullest reliance in her promises, knowing full well that as she has acted on one occasion, so she will act again under similar circumstances. Some of these laws are known to us, others have as yet to be discovered, but are daily being revealed, and placed at our disposal. We cannot always act in accordance with laws that we do *not* know, but do we always obey those which we *do* know? If we did, we should be relieved of much sickness and its accompanying misery.

It might be thought, from what I have said, that it would be useless to pass any measures of Sanitary Legislation, for Nature will have her way in spite of you. If these measures were conceived in a spirit of antagonism to Nature, they would be useless, or worse than useless, and you may depend upon it that where pestilence has visited a locality, or where there has been an abnormally high death-rate, it will be found that Nature's laws have been disobeyed. If, therefore, your legislation is to be of any avail, it must have for its object the utilization of Nature's forces. By compelling the community not to disregard the laws of health, you are allowing the laws to work harmoniously for the benefit of that community. But if one single law is disregarded, the balance of Nature is overturned, and, her laws being relentless in their severity, she will have her revenge. There is a power of aggregation and disintegration continually going on, both in the individual and in the nation. In a healthy subject, these two processes balance or compensate one another, and the same system prevails in a town. The waste products of a town may be removed by means of drainage to the surrounding country, where Nature will utilize them for the benefit of man. If, on the other hand, these are retained in the neighbourhood of dwellings, they are not being devoted to the purposes intended, but, on the contrary, become seats for the propagation of disease. There are constantly moving about in our atmosphere myriads of disease germs, seeking, as it were, places where they can obtain a foothold. If our homes are clean and well ventilated, they will pass harmlessly by, but if they find any decaying matter upon which they can settle, they will certainly do so, and we pay the penalty. Let us, therefore, once and for all, recognise the vital importance of living in a perfectly sanitary condition. We may be able, to a certain extent, to bring this about by legislation, but legislation is of no use unless it is enthusiastically and intelligently carried into effect by the people it is intended to benefit. Whatever this legislation be, let it follow, and not seek to drive, the forces of Nature. When we have done this, we shall reap our reward in increased comfort, a diminution of sickness and disease, and a lowering of the national death-rate. We shall obtain blessings greater than prolongation of life, which, without health, is often a curse rather than blessing—give a man health, and you give him something more to be desired even than length of days. You give that which alone makes life enjoyable, or even bearable — you give him contentment and happiness.

> Nor love, nor honour, wealth, nor power
> Can give the heart a cheerful hour
> When health is lost. Be timely wise:
> With health all taste of pleasure flies.

THE AGRICULTURAL UTILIZATION OF SEWAGE.

By C. R. DRYSDALE, M.D.

THE object of this paper is to shew that the only rational and satisfactory method of treating the sewage of London, and of all large towns and cities without any exception, and of restoring the rivers flowing through them to their original purity, is, by the method now carried out so successfully in Paris, Berlin, Hamburg, Breslau, and Danzig, and which plan St. Petersburg, Moscow, and Warsaw are about to imitate, although these European cities have all been led to adopt this system by the example afforded them, and from the information obtained in England, the capital of which has been so feebly and unskilfully advised in this matter by the professional men attached to the London Board of Works. When it is remembered that sewage farms exist, and are in most cases successfully carried out, at Banbury, Basingstoke, Bedford, Blackburn, Birmingham, Bradford, Cheltenham, Chorley, Croydon, Doncaster, Dewsbury, Harrowgate, Hitchin, Kendal, Leamington, Merthyr, Malvern, Northampton, Reading, Winchester, Wolverhampton, and Wrexham, &c., it is sad to think that Lord Bramwell's Commission should have been able to refer to the condition of the noble river, the Thames, as "a disgrace to civilization." No wonder that Glasgow and Dublin still continue to turn their rivers into open sewers, when the Metropolis of civilization gives such an example of sluttish laziness and extravagance. But Glasgow, I rejoice to say, is already beginning to move in the matter, and (partly, I believe, in consequence of a debate on this great question which took place in that city in August last, at a meeting of the British Medical Association, and which was attended by Dr. Alfred Carpenter, Colonel Jones (of Wrexham), and myself,) has sent Mr. John Young, the Inspector of Cleaning, of Glasgow, last autumn, to Paris and Berlin, to Nottingham, Birmingham, and Croydon, to study the sewage farms of these districts, and report as to what should be done with the sewage of Glasgow. He recommends that 4,500 acres of land should be purchased for the purification of the Glasgow sewage, in the valley of the Cart, by broad irrigation, and also by intermittent downward filtration; and assumes that suitable land can be had at a price of £120 per acre. This is the very last opinion delivered on this important point, and is the only scientific plan, and the only one which is compatible with economy of food supplies. This last is a very important consideration, for the example of China shews that a nation may maintain its food supplies unimpaired for thousands of years, on condition that its people restore to the soil the whole of the nitrogen contained in the food grown upon it, and which is found in the excreta of human beings, as well as in those of the lower animals.

The Metropolitan Board of Works has been a flagrant example of want of all plan in this matter. For years past that Board has gone on tormenting the long-suffering dwellers on the banks of the Thames and round the port of London, by pouring daily about 150 millions of gallons of sewage in dry, and 200 millions of gallons in wet weather into the river, and has recently added a greater enormity, namely, the erection of an extravagant tank at Barking, for £500,000, where a useless chemical experiment is to take place, and a vessel has been constructed to convey the precipitated sludge down the river. Another tank was to be constructed at Crossness; and together these two useless reservoirs were to cost one million sterling, whilst the chemicals were estimated as likely to cost £100 000 per annum. Dublin, Glasgow, and even Edinburgh, are nearly as bad, for the two former cities have rivers which are a disgrace to civilization and to their municipalities, since they are a horror to the citizens, and to visitors who pass along them, whilst Edinburgh only utilizes, in a very slovenly manner, a portion of its sewage.

On the other hand, the sewage farms of Paris, at the plain of Gennevilliers, have gradually become a most important experiment in the utilization of sewage, since the time when the late distinguished city engineer, M. Durand Claye, after carefully surveying the sewage farms of England, and abandoning in despair, as worse than useless, and utterly hopeless, all chemical plans for dealing with the sewage, commenced to experiment on the purification of some of the Parisian sewage by filtering it through a few acres purchased by the city of Paris, and situated at Gennevilliers. Irrigation at Paris dates from 1869, and the irrigated surface has gradually increased, as it has become popular among the small proprietors who cultivate their little farms in the plain of Gennevilliers. In 1872, 51 hectares were irrigated; in 1875, 200; in 1880, 450; in 1887, 650 hectares, or 1,600 acres. Chemical trials were made at the commencement, principally with sulphate of alumina, but these were soon abandoned, because the operation was rather costly, left large unsightly heaps of sludge, and produced only a most incomplete purification. Up to the present date, the sewage has been supplied gratuitously to the small cultivators, who are not bound to receive the same quantity all the year round, although, as a matter of fact, the quantities applied represent very nearly a regular fraction of the entire volume. None of the peasants contribute to the expense of pumping and distributing the sewage. With regard to the question of nuisance, or danger to health, there were complaints at the commencement; but these have entirely ceased since the establishment of five lines of drains. The city of Paris proposes to extend the system of irrigation, so as to utilize all the sewage, and to stop entirely all entrance of unpurified sewage into the Seine. About 20 millions of cubic metres of sewage are purified at present at Gennevilliers. The prosperity of the inhabitants of the plain, and also its salubrity, have both increased since the introduction of the sewage. In the five years ending 1886, the population increased 34 per cent., and the annual rental of the land increased from 90 to 450 francs per hectare. The Parisian authorities have recently sent reporters to the Berlin sewage farms, and this year they have voted funds for the purchase of about 2,000 acres of land in the forest of Saint Germains, whiist another grant is spoken of for the purchase of land on the East side of Paris.

The amount of market produce obtained on the farms at Gennevilliers is quite remarkable, as much as 40,000 heads of cabbage per hectare (16,000 per acre) 100,000 kilos of feet per hectare (40 tons per acre), &c. Some of the peasants raise a gross annual value of £120 to £400 per hectare. Vegetables of every kind are grown in profusion for the Parisian market and in 1887 when I last visited the farms, the season had been very dry, so that the greater proportion of the best vegetables at the Halles of Paris was sent from Gennevilliers.

The contents of a cubic metre (220 gallons) of the sewage as it flowed through the farms in 1883 amounted to 0·581 kilos of volatile and combustible matters, and to 1,355 kilos of mineral matter: together 1,936 kilos per cubic metre. The effluent, which I have myself drunk and found to be quite potable, contained 0·156 kilos volatile and combustible matter, and 0·506 kilos of mineral matter per cubic metre. The irrigation and purification of the sewage goes on in winter as well as in summer. Thus, in January, 1883, 183,000 cubic metres were filtered; in May, 2,100,000. The sewage water seldom freezes.

The main sewer of Paris is on the north side of that city, and when it reaches the Place de la Concorde, it strikes north-west to the pumping station at Clichy, which is on the East bank of the Seine, opposite Asnieres. The sewer from the south of Paris passes across the river by two syphons, and it eventually joins the other at the pumping station. The main sewer is 16 feet in height, 13 feet in breadth, and about 3 miles long. At present about two thirds of the sewage flows into the Seine below Clichy; but the scheme referred to for purchasing lands at St. Germains will purify all that portion of the sewage of Paris. An arrangement has been made between the Government and the City of Paris by which the lands at Achères, 799 hectares or about 2,000 acres, are to be let to the city for 20 years at a rental of £2 per acre with the option, on the part of the city, of purchasing the whole for 3,280,000 francs (or £131,000) at any time during the continuance of the lease. This is at the rate of £66 per acre, a price which, compared with that which the lands obtained by municipalities have cost in this country for similar farms, is indeed moderate.

Dr. Bourneville, Deputy of the Seine, published in 1886, and again this year, a report on the purification of the Seine. After giving a long list of cities on the Continent and in England which have adopted irrigation with great success, he says: "The large experience of Gennevilliers confirms the great laws of natural purification and agricultural restitution." Paris has at present a population of 2,230,000; its area is 19,274 acres; average rainfall, 24 inches; and total dry weather volume of sewage about 66 million gallons per diem. Of the land irrigated by the sewage, only six acres belong to the city of Paris, the remainder consists of numerous small properties, often cultivated by tenants. These irrigated lands let at about £4 10s. to £6 10s. per acre quite freely. Kitchen vegetables and grass are chiefly grown; but fruit trees, nurseries, cereals, and industrial plants are successfully cultivated. Mr. Bechman, now Civil Engineer to the city of Paris (Journ. d'Hygiene, January 17th, 1889), observes that with respect to the various processes for purifying the sewage of cities, the mechanical process which separates the solid matter and decants the soluble matter can only be considered as a preparatory process; and as to chemical methods, they may succeed in a laboratory, but have all completely failed when made on a grand scale. The A B C process, where alum, blood, and charcoal, are employed as purifiers, is referred to as the English process ; but that experienced engineer sums up thus: "In all countries purification by the soil has been found, without any doubt whatever, to be the best. This is not a novelty, since traces of this plan have been found in Jerusalem, and, not to go so far back, sewage purification by the soil has gone on for centuries in Milan, Seville, and in Edinburgh." The soil is the best purifier of water charged with organic impurities. It acts first of all mechanically, as a filter, retaining the grossest materials at the surface. Filtration in the upper layers is so complete that in cases where the thickness is sufficient, and the land suitably chosen, the filtered water flows away perfectly limpid. The microbes themselves are retained to such an extent, that in the water in the Gennevilliers drains, microscopic analysis shows only about 20 bacteria, whilst the water of the Parisian sewers contains a thousand times as many. At the same time, a combustion of organic matter goes on in the vacuoles of the land, a kind of fermentation, which nitrifies the nitrogenous matter by means of the oxygen imprisoned in the air. The vegetation which goes on is also a powerful auxiliary, for by its means a great portion of the water is evaporated. The process of agricultural purification by sewage irrigation may either consist in simple downward filtration without agricultural utilization, or it may be combined with cultivation as it is in Paris and Berlin. M. Bechman says that: "In spite of objections of all sorts, and unreasoning prejudices, or chimerical fears about the salubrity of the district, in spite of lawsuits and other resistance, conviction has been attained. Barren sands, poor and arid soils, which produced scarcely anything but oats and potatoes, have been gradually transformed into a country rich in culture, the products of which are prized in the market. The plain of Gennevilliers has had a most healthful history, and its population has tripled in ten years." The city of Berlin, aware of the results obtained at Gennevilliers, has created, entirely on its model, a complete system of agricultural utilization of the sewage. It possesses at present irrigation farms on which the sewage is employed, which is pumped to them by engines, and with terminal collectors. In spite of the unfavourable conditions which have been met with in Berlin, such as the shallowness of the soil above water level, the impossibility of using more than from 10,000 to 12,000 cubic metres per hectare on the ground, no sewage at present re-enters the River Spree unpurified. Large domains purchased by the State, and cultivated by the Government, produce forage, vegetables, &c. The income, as yet, does not completely cover the outlay, but already the day is foreseen when the Berlin sewage farms will give a suitable revenue for the capital employed in their establishment. The farms employ at present no less than 2,056 persons, and are a perfect success. The cities of Berlin, Danzig, and Breslau, with an aggregate of about two million inhabitants, have possessed similar farms for about 15 years. Berlin, with a population of 1,400,000 inhabitants, covers 15,266 acres, and has an average rainfall of 23·6 inches per annum, and a water supply of only 16 gallons a head. The volume of sewage, which is all raised by pumping, amounts to 31 millions of gallons daily, a comparatively small quantity, which, therefore, cannot be so easily filtered as more dilute sewage can. After sending experts to England and France, a complete scheme of sewerage on the English system was adopted in 1874. Berlin is now divided into twelve sanitary districts. In seven of these the London plan "all to the sewer," is the maxim which has been attended to. Each district has its pumping station, and the sewage is forced through cast iron pipes to the farms. Large tracts of land have been acquired on all sides of Berlin, especially to the north and south of the city, for the purpose of irrigation. For administrative purposes, these farms are formed into five groups. The distance traversed by the sewage to the farms, is from six to eight—and even ten miles. The mains are 40 inches in diameter. The farms are laid out in rectangular plots, and each of these is surrounded by a trench and embankment. The trench is flooded from the carriers, and the sewage over-flows the plot, which is usually about half an acre in size. About 1,400 such plots on the Malchow farm are let to market gardeners, and they get what sewage they want. Hand labour is used in the culture of root crops and vegetables; and it is only in the case of grain crops that ploughing is used. The total area of one farm, that of Malchow, is 3,212 acres, and 600 work-people are employed on it, 2,520 acres being irrigated by sewage. Only 1,532 acres, however, are irrigated each season, the remaining 988 acres are sown with grain and get no sewage. About 444 acres bear Italian rye grass, and five or six cuttings are made yearly, whilst 1,087 acres are devoted to mangolds, carrots, cabbage, and other vegetables and roots. Some parts of the farm are drained 39 inches deep, and 15 to 20 feet apart. No land is kept fallow. There is no difficulty in continuing the irrigation during frost, for the sewage temperature is 41°—43° Fahrenheit. In autumn, prepared filtered beds are used for filtering the sewage, and crops are raised there next spring. Last autumn there were seventy milch cows, and sixty working oxen on the Malchow, with 14 working horses. The great bulk of the produce, however, is sold in Berlin. A contractor milks the cows and takes the milk to Berlin. The present farms belonging to the city of Berlin have a total area of 4,453 hectares, or about 11,000 acres, of which, however, only 6,780 acres are irrigated, and of these, only 3,719 acres have been drained. The object seems to be to irrigate as great a surface as possible with the sewage rather than to purify it upon the smallest possible area. Some complaints were made at first from a sanitary point of view about the Berlin sewage farms; but since more land has been procured, and less sewage used per acre, no more complaints are heard, and Professor Virchow's reports shew the complete harmlessness of sewage irrigation as far as health is concerned.

In consequence of the limited water supply of Berlin, its sewage is more polluted than that of most cities, and smaller quantities of it can therefore be put on a given area. The idea of throwing such a fertilising agent into the sea is regarded in Berlin as an enormity. Convalescent homes have been established on two of the farms, shewing how entirely healthful these are. The length of one of the conduit pipes from Berlin to the sewage farm is more than ten miles.

The employés on the farms in 1885 consisted of 40 officials, 45 gardeners, smiths, and dairymen, 480 male and female labourers: 966 workhouse hands, all of these continually employed, and, in addition to these, there were 360 men, women, and children, employed from April to October. In one week in October, 1887, 30,000 cwt. of cabbages were sent by rail to Berlin from one of the farms named Osdorf. In 1885, there were about 275 hectares (687 acres) under root crops: 91 hectares in hemp; 1,625 hectares (4,062 acres) under wheat; 44 hectares of peas and beans; 148 hectares under fodder; 696 hectares of potatoes, cabbages, and the like; 76 hectares nursery gardens, and 1,267 hectares (3,167 acres) of meadow land and pasture.

In March, 1886, the capital borrowed by the Berlin Sewage Irrigation Board appears to have been £3,211,138; whilst Sir R. Rawlinson said at a meeting of the Society of Arts in 1887, that the London sewage plan of the Board of Works would eventually cost 10 millions sterling for no purpose, and without the slightest benefit to agriculture. The treatment of the London sewage at present by 3.7 grains of lime, 1 grain of sulphate of iron, and a little permanganate of potash per gallon, seems trifling with the question, since cities which have hitherto used chemicals have found that nothing short of one ton per million of gallons is of any use. What wonder, then, that in 1887, Dr. Collingridge the Medical Officer of Health for the City of London, should complain that the condition of the Thames was as bad as ever, despite these chemicals.

Last year (1888) the Senatorial Commission appointed at Paris to examine the question of purchasing more land for the purification of the Seine, went to Berlin at the commencement of July ("Jour. d' Hygiene," July 26th, 1888).

One of the Commissioners, Dr. Cornil, thus speaks of the 15 farms of Berlin:—"The water of the effluents of Heinersdorf and Blankenberg is as limpid and pure as possible, although it flows in the open air, and receives the debris of the leaves and ozier beds which grow on its banks. We drank it, and were informed that chemical analysis shews an absence of organic matter in it, whilst it contains no greater proportion of microbes than spring water from the drains of the farm, and is so pure that trout are reared in it, and that the fishery is estimated at £15 per annum. In the fields of Malchow seven harvests of splendid rye grass are cut every year. At Heinersdorf we ate some splendid strawberries raised on the irrigated fields. The lake of Tettow has pure and limpid water, and is situated among villa residences where the inhabitants remain the whole year."

Professor Virchow says (Journ d'Hygiene, July 26th, 1888):—"The present organisation of Berlin in sewage farming is the best possible. Pathogenetic microbes are destroyed on the surface of the purifying beds, and also in the superficial layers of the soil. The agricultural utilization and filtration through the soil purify the water." There are no cases of typhoid fever in the farms, and the health of the inhabitants is excellent.

Professor Koch (the discoveror of tne bacillus of consumption) gives the following evidence (Jour d' Hygiene, loc. cit.):—"Everyone now drinks the effluent from the sewage farms, and has done so for some years past. The early law-suits against the Administration were due to the fact that in early days one hectare (2½ acres) was made to purify the sewage of 750 persons instead of 250, as now. There is no danger of the progressive contamination of the soil, if the amount of sewage is regulated, and we may go on irrigating quite indefinitely. Sand mingled with clay is the best kind of soil. Comparing Parisian sewage farms with those of Berlin, Dr. Koch added, 'I consider that a canal to the sea is not practical and that the purification of the soil should succeed better at Paris than at Berlin; because, firstly, there is a thicker layer of sand; secondly, the sewage is much more dilute: thirdly, the lands to be irrigated lie along a great river, into which the drains flow. All this applies to the case of London.

As to the purification of the Thames, all the conditions laid down by Dr. Koch hold good; and in the present depressed condition of agricultural industry, thousands of acres in Essex and Kent might be cheaply purchased by London, and the system which works so well in Paris and Berlin could at once be tried upon two or three thousand acres in Essex along the river side not far below Barking. Mr. Bailey Denton, the engineer who has had the largest experience of sewage farms in this country, in company with Colonel Jones, of Wrexham, who is himself a practical sewage farmer, has made detailed estimates of the expense of carrying the London sewage down the river on the Essex side of the Thames to an island called Canvey Island, about twenty miles distant from Barking, conveying the sewage of the southern outfall across the river to join the conduit at Barking. At Canvey Island, these gentlemen purpose at once to secure 4,500 acres of suitable land, where the sludge could be separated and the effluent used for agricultural purposes. The conduit, which would be twenty miles in length, could be tapped as it was carried along, and farmers on the sewage farms of London or any other suitable farms, might utilize the sewage, as soon as they have become enlightened enough to profit by the experience of Paris, Berlin, Croydon, Birmingham, Nottingham, and other sewage farms. It is perfectly clear to my mind that, in the near future, agricultural utilization and purification of the sewage of all civilised cities and large towns will become an article of popular hygienic faith, and we may feel sure that the next generation will dwell in cities, by the side of pure rivers or streams where the water supply shall leave the precincts of the city as pure and as potable as it entered it.

THE STATUS OF SANITARY INSPECTORS.

By HUGH ALEXANDER, Chairman of the Association of Public Sanitary Inspectors of Great Britain.

Mr. President, Ladies, and Gentlemen,

Amongst the important questions which have occupied, and which will yet occupy the attention of this Health Congress, perhaps there is none upon which the great interest of the Public Health are more dependent than that of the "Status of Public Sanitary Inspectors"; and perhaps there is no matter of equal importance upon which public opinion stands more in need of information than upon the conditions under which Sanitary Inspectors at the present day subsist, and under which they discharge their duties; it is also very much needed that public opinion should be informed as to what is necessary to be effected in legislation, so that in the impending changes in Sanitary law the position of the Sanitary Inspectors may be freed from ambiguity, and that the interests of the Public Health may be secured by the appointment in the future of only properly qualified and properly remunerated officers.

It goes without saying in this assembly that no one should die save from old age, and it will probably go without contradiction that not less than 100,000 lives are sacrificed every year in this country to preventible causes. If that statement be accepted, it must be admitted that the Sanitary service, that is, the preventive force of the country, is not equal to the occasion, and it must appear that it is deficient in quantity, or quality, or both; in either case I venture to submit on behalf of the Council of the Association of Public Sanitary Inspectors of Great Britain, that the result is due to the fact, that throughout the whole course of Sanitary legislation the Legislature has continuously failed to perceive that the only way to give proper effect to the laws relating to the Public Health is to fasten responsibility upon the Sanitary Inspectors for their administration, at least, in so far as relates to the inspection and detection of nuisances, and the initiation of proceedings for the abatement of nuisances, and to protect such officers, and also the public interests involved in the discharge of their duty, by a statutory enactment clearly defining as to the appointment, qualifications, powers, responsibilities and minimum salaries of Sanitary Inspectors.

As to the powers of a Sanitary Inspector. It is a popular delusion that it is the duty and within the legal power of a Sanitary Inspector to require the abatement of a nuisance as soon as it has come to his knowledge. That is not so, the strict legal function of a Sanitary Inspector is simply to inspect, and to report as to his inspections to the Local Authority, whose officer he is, who may, if they think fit (not shall) take action thereon. This very inadequate arrangement for the abatement of conditions injurious to the public health, was possibly a reasonable, and perhaps, a necessary cautious proceeding in the primary formation of a large body of officers who would be called upon to exercise their functions under a new order of things, not only without experience in themselves, but with whose work it was necessary that the public mind should gradually be familiarised and educated into sympathy; but it has long been recognised that the legal obligation, simply to inspect conditions injurious to health, and report thereon to a Local Authority (perhaps at a distant meeting) did not, and could not, respond to the need, or the demands of the public, nor satisfy the moral obligation which devolves upon a conscientious man in the discharge of the duties of a Sanitary Inspector.

Many Inspectors have therefore of necessity, but entirely without legal authority, adopted the practice of serving notices requiring the abatement of nuisances as soon as they are discovered, and the necessity for this procedure is generally recognised, and, in the great majority of cases, where an Inspector is supported by an enlightened Local Authority, his notices are attended to before he has an opportunity of reporting to his Board on the necessity which existed for serving them.

The public have in this way been familiarised and educated into sympathy with the labours of the Sanitary Inspector, and the Inspector has developed in the long exercise of his duties; he is no longer an inexperienced and unknown functionary, from whom the legislature can with propriety, or without detriment to the public interest, continue to withhold the legal power to serve a notice to secure the abatement of a nuisance. On the contrary, he has become, where he has been given fair play, the friend and the adviser of the people amongst whom he moves, and to fulfil the requirements of his position in a proper manner, he must now be something of a civil engineer, architect, builder, doctor, and lawyer, in order that he may be enabled to advise and supervise structural alterations, and in order that he may be able to detect and correct the errors and misdeeds of builders and builders' workmen, and diagnose and trace out the hidden causes of disease, and carry out the legal work of his office efficiently In addition to all which he must have some knowledge of men, for the right discharge of his duties with a minimum of friction.

If the measure and importance of the duties devolving upon a Sanitary Inspector are fairly apprehended from that statement, I will now invite you in the interests of the public health to consider with me the disabilities under which they are discharged.

To begin at the beginning, one would very reasonably suppose, if not informed to the contrary, that such officers would, under the law, and as a foundation for their position, possess one common, well approved, and honourable designation, but, strange to relate, that is not so. Under the 9th Section of the Nuisance Removal Act of 1855, which formerly applied to the whole country, and which still applies to the Metropolis, they are entitled Sanitary Inspectors; under the 133rd Section of the Metropolis Local Management Act of the same year (1855), the same officers are (as though it were no consequence how they were named) classified as Inspectors of Nuisances; how that anomaly, that lack of co-ordination in rank, under two contemporaneous Statutes came about, is not very clear; it was possibly an oversight on the part of the legislature; but, however it arose, it is very regrettable, as it appears in the Public Health Act of 1875 (Sections 189 & 190) to have led to the rejection of the name of Sanitary Inspector, and to the adoption of the less acceptable and the less generic title of Inspector of Nuisances. This, we submit, should be amended by a full legal recognition of the title of Sanitary Inspector.

As to the duties which devolve upon Sanitary Inspectors and the great want of legal definition thereof:—The 20th Section of the Sanitary Act of 1866, which formerly applied to the whole country, and which still applies to the Metropolis, declares as to inspection of nuisances, "It shall be the duty of the Nuisance Authority to make an inspection of its district, to ascertain what nuisances exist, either by itself or its officers." And for the same purpose, the 92nd Section of the Public Health Act, 1875, which applies to the whole Kingdom, excluding the Metropolis, declares, "it shall be the duty of every Local Authority to cause to be made from time to time inspection of their district, with a view to ascertain what nuisances exist." In the first mentioned Act, the Congress may note there is an indefinite reference to officers, but in the last mentioned Act, there is no reference to officers at all; and as this work of inspection is the peculiar work of the Sanitary Inspector and of no other officer, we submit he should be distinctly named, and his duty in this, as in all other matters, clearly defined.

I have already in general terms referred to the fact, that a Sanitary Inspector is under no legal obligation to make any effort to secure the abatement of a nuisance, until he has reported thereon and received instructions from his Board; this will be seen by reference to Sections 93, 94, of the Public Health Act, 1875. Section 93 says, "Information of any nuisance under this Act in the District of any Local Authority, may be given to such Local Authority by any person aggrieved thereby;" as to which it is obvious that aggrieved persons do not require that it should be enacted that they may complain. The Section proceeds, "or by any two inhabitant householders of such district, or by any officer of such Authority, or by the relieving officer, or by any constable or officer of the police force of such district." Thus aggrieved persons, two inhabitant householders, relieving officers, and policemen are specifically named, whilst the Sanitary Inspector, the particular officer upon whose shoulders the whole business really devolves, is not designated at all; this is certainly remarkable enough in itself, but it is still more remarkable if it be considered, that this section, which excludes in so marked a manner the name of the Sanitary Inspector, and even the Nuisance Inspector, is copied from the 10th Section of the Nuisance Removal Act, 1855, which in its list of those who may make complaint to the Local Authority, gives precedence to, and makes specific mention of the Sanitary Inspector; it would be instructive, and it might be useful if we could be supplied with the reason for this, amongst other retrogressive features of the Public Health Act as they refer to, or omit to refer to, the position of the Sanitary Inspector. I now come to the consideration of initial procedure as prescribed by law. Section 94 enacts that, "on the receipt of any information respecting the existence of a nuisance, the Local Authority shall, if satisfied of the existence of a nuisance, serve a notice on the person by whose act, default, or sufferance, the nuisance arises or continues." This is conclusive, that to be strictly within the four corners of the law, the

Inspector's action must be confined to reporting or making complaint (as it is phrased in the Public Health Act) of each separate nuisance to the Local Authority, who, if satisfied thereon, shall serve a notice on the person causing the nuisance.

For this mode of procedure I have already said there might have been some apparent reason in early days, but having once been adopted, its formula has been copied without reason in all subsequent Acts, *e.g.*, Section 22 of the Sanitary Act of 1866, specifies, "that where any Local Authority are of opinion on the certificate of their Medical Officer of Health, that if the cleansing and disinfecting of any house, or part of a house, or articles in a house, would tend to prevent the spread of disease, it shall be the duty of such Authority to give notice in writing to the owner or occupier, requiring the same to be done." Section 46 of the Public Health Act of 1875 would convey to an inexperienced person that such roundabout procedure is of great efficacy, as it sets forth the necessity for the certificate of the Medical Officer of Health as in the previous Act, and alternatively the certificate of any two medical practitioners, on receipt of which, if it appears to the Local Board that cleansing, &c., will be beneficial, they, the Local Authority, shall give a notice in writing to the owner or occupier requiring the same to be done. I submit to the Congress that while a law is allowed to exist, it should at least be possible to attain the purpose to secure which it was framed, and by the process which it prescribes; but imagine a Sanitary Inspector fettered by such restrictions in the face of an epidemic of smallpox or cholera; in the first place he must call the attention and secure the certificate of the Medical Officer of Health in every separate case, "where the cleansing and disinfection of a house or part of a house would tend to prevent the spread of the disease;" and according to the Public Health Act, if he cannot secure the Medical Officer's attendance, he must obtain the attendance and certificate of two Medical Practitioners; then, armed with the certificate of the one or the other, he must apply to the Local Authority when they next meet; then if it appears to the Board necessary, they shall serve a notice on the owner or occupier to cleanse, &c., the premises. I need scarcely say that this procedure, which is only calculated to interpose delay where the utmost promptitude is needed, is utterly impracticable, and being so is generally disregarded, the practice being to serve notices at once as is most expedient, but for which practice there is positively no legal authority.

I now submit, on behalf of the Council, that the interests of the public health demand that it shall be declared by law to be the duty of all Sanitary Inspectors to enquire into all complaints as to nuisances dangerous to health, and to inspect the district for the detection of nuisances dangerous to health; and in all cases where such nuisances are found to exist, it should be declared by law to be the duty of the Sanitary Inspector to serve a notice forthwith on behalf of the Local Authority, whose officer he is, requiring the abatement of such nuisances forthwith; and it should be declared to be the duty of the Inspector to report to the Local Authority, or a Committee thereof appointed for such purpose as to such nuisances, and also as to notices served on behalf of the Local Authority, for the abatement of such nuisances, and if such notices be adopted and approved by the Local Authority, or the Committee appointed for such purpose, and only after such adoption and approval, it should be declared to be the duty of the Inspector to proceed if necessary, and without further authority, against the person or persons causing or permitting the continuance of the nuisances.

I have now shown that the legal designation of Inspectors is anomalous and conflicting; and I have also demonstrated that Inspectors have no power of initiating proceedings by serving a notice for the abatement of a nuisance, and thereon I submit that the foundation is not truly laid, and that the whole superstructure of Sanitary law is consequently defective and unreliable. That such is the condition of the law is well known, and, therefore, on this occasion it needs no more—and indeed the limits of this address will not admit of more—than a passing reference to the chaotic and confusing mass of enactments, and amendments upon amendments, spreading over the last forty years, which encumber the Statute Book, the character of which justified Mr. Boodle, an eminent solicitor, in saying to the Royal Commission on the Housing of the Working Classes, "From reading them it is difficult for people, who are not lawyers, and who have to administer these Acts, to understand them fully; they are almost as complicated as the Church Building Acts, which nobody has as yet understood."

This expression of opinion recorded in the report was supported by the following recommendation:—"Your Majesty's Commissioners would therefore recommend the consolidation of the Sanitary laws as regards the Metropolis," and "If such a consolidation were to be undertaken, the opportunity should be taken of making certain amendments."

As this important recommendation will, doubtless, soon be within the range of practical politics, I venture to submit, on behalf of the Council of the Association of Public Sanitary Inspectors of Great Britain, that such consolidation should not be confined to the Metropolis, and that the Council are of opinion, founded on wide experience, that the great desideratum of the age is one Public Health Act for the whole kingdom, simple yet comprehensive in its scope, and in its primary provisions, specifying distinctly as to the appointment of Sanitary Inspectors, fixity of tenure of office, necessary qualifications, duties, and responsibilities, and minimum salary of such officers.

In support of, and in elucidation of the views of the Council upon these points, I will again refer to the Report of the Royal Commission on the Housing of the Working Classes. As to qualifications of Inspectors, on page 33, we read: "Much evidence was given from "various parts of London, which proved both the "absence of adequate inspection and of sufficient activity "in the Inspectors. The perfunctory method of certain

"Sanitary Inspectors was described, and it is evident "that where work is performed according to the custom "of certain districts of the Metropolis, it really does not "matter whether the staff of Inspectors be large or small."

"Activity alone when procured will not be sufficient; "it is necessary that trained men should be selected who "have some knowledge of Sanitation and of building "construction." Sir Hugh Owen, the Secretary to the Local Government Board, said that, "It would be an "advantage if Sanitary Inspectors were required to obtain "some certificate of fitness after examination by an "authorised body." Mr. Cubitt Nicholls, the Adviser of the Home Office on Artizan's Dwelling Schemes, thinks that "All Inspectors ought to be acquainted with building "construction, and that even disciplined men of good "character, like old soldiers who are sometimes employed, "are of no use unless they have served in the Royal "Engineers; in this opinion he is supported by Sir "Edwin Chadwick." These expressions of opinion are followed by the following recommendation: "Your "Majesty's Commissioners would recommend that advice "should be given to Metropolitan Sanitary Authorities to "increase in some cases their staff of Inspectors, and in "all cases to select persons acquainted with the principles "of Sanitation and of building construction."

These opinions and the recommendation of the Commissioners agree with the teachings of our experience, not as to the Metropolis alone, but as to Sanitary Inspectors, and Sanitary Inspection generally throughout the country; and we would only add, that an examination of candidates for the position of Sanitary Inspector to be of any value must be thorough, and not of such a character as will admit of men whose lifelong avocations have had no affinity with building operations, being coached up in a few months, and obtaining a certificate of fitness to assume the functions of a Sanitary Inspector.

If the Congress agree with Her Majesty's Commissioners, that only men who are acquainted with the principles of Sanitation and of building construction should be appointed to the position of Sanitary Inspector, it will doubtless be conceded that such officers, giving all their time, energies, and special knowledge to the public service, should be liberally remunerated; but, unfortunately for the interests of the public health, every Local Authority in the kingdom is practically permitted to appraise according to the measure of its wisdom or unwisdom, the degree of qualification required in a Sanitary Inspector, and the money value of his services. How that operates may be appreciated by reference to a list of returns obtained by the Council of the Association some time back, from 225 officers occupying the position of Sanitary Inspectors throughout the kingdom, from a digest of which it appears that there were 30 men at salaries beginning at £10 and under £50, 59 beginning at £50 and under £100, 76 beginning at £100 and under £150, 38 beginning at £150 and under £200, 19 beginning at £200 and under £250, 2 beginning at £250 and under £300. From consideration of these figures it must be quite evident that there are many Local Authorities who are guilty of very flagrant evasion of the law, which requires them to appoint Sanitary Officers to safeguard the public health, for as they do not pay for the services which the public health demand, it is quite certain the service is neither rendered nor expected. We therefore submit that, in the matter of the salaries of Sanitary Inspectors, the principle of Local Representative Government can suffer a little violence with much advantage to the interests of the public health, and as the law requires Sanitary Inspectors to be appointed, we further submit it should also declare, in addition to specifying necessary qualifications, a minimum salary for such officers of at least £200 per year.

As to tenure of office, there being no legal obligation to the contrary, many Local Authorities elect their Sanitary Inspectors, not permanently, but for various terms of one, two, and three years; this practice, it is quite obvious, whatever a man's qualifications may be, or the amount of salary paid to him, is an effective and degrading check upon him in the discharge of his duty, between the members of his Board and their friends on the one hand, and his self-respect on the other, he is on the horns of a dilemma. If he does his duty he is not re-elected at the expiration of his term. If, on the other hand, duty is restrained by personal considerations, his self-respect is sacrificed and he has entered on a downward path. We therefore submit, that Sanitary Inspectors should be elected to a permanent tenure of office, and should only be removable therefrom for misconduct, neglect of duty, or incompetence. In conclusion, I desire to say, on behalf of the Council of the Association whom I represent, that we disclaim any desire to invest Inspectors with arbitrary powers, or any purpose to diminish the rightful authority of Local Boards over the officers whom they employ, and that on the contrary, we believe, and are strongly of opinion, that it would be found, by such definitions and additions to the law as I have indicated, and which our experience has proved to be necessary, that whilst the efforts of Sanitary Inspectors in the interests of the Public Health would be rendered more effectual, the authority of Local Boards would also be largely increased thereby, and that Sanitary Law would be placed on a sound basis, and its administration entitled to public respect.

At the close of the discussion which followed the Address, Earl Fortescue moved, and Sir Edwin Chadwick seconded, the following Resolution (which was carried unanimously with cheers):—

> "That this Health Congress desires to record its opinion that, in "order to secure proper sanitary inspection, it is desirable that only "properly qualified men should be appointed to the position of Sanitary "Inspectors; and that such officers should be adequately remunerated "and protected in the discharge of their duty, and not be discharged, "nor their salaries diminished, without the sanction of the Local "Government Board. The Congress also desires to express the "opinion that all Sanitary Inspectors should be required by law to "inspect the district to which they are appointed, in order to detect "the existence of nuisances, and in such cases to serve notices for "the abatement of such nuisances—which notices should be read at "the next meeting of the Board or Committee appointed for such "purpose, and, if approved, such notices should be valid, and "proceedings taken thereon as occasion may require."

THE HYGIENE OF ASYLUMS FOR THE INSANE.

By RICHARD GREENE, F.R.C.P., Edin.,
Superintendent County Asylum, Northampton

PRELIMINARY.

When the President suggested to me that I should read a Paper to the Congress on Asylum Sanitation, I answered that there was scarcely anything in which the Hygiene of Asylums differed from that of an ordinary house; that special contrivances for the use of the Insane have become rarer and rarer until at the present day such Institutions very much resembled large Mansions or Hospitals for ordinary cases; or more correctly something between Mansions and Hospitals. The spacious Wards and abundance of light and air remind us of Hospitals, while the furniture and home comforts give them more the appearance of Mansions. At least, those would be the impressions made on a casual visitor who went round any one of our best Provincial Asylums. Nevertheless, there are a few points wherein certain differences exist; a few principles which should guide those about to build or fit up Institutions for the care and cure of the Insane. It is my intention to touch lightly on these points—to steer as widely as possible from mere theories—and to state what has apparently been borne out by an experience of twenty years as an Asylum Medical Officer.

SITE.

First, as to Site. It has ever seemed to me that the majority of our County Asylums are built in situations too high and exposed for our variable English Climate. It is not likely that our forefathers experimented much with the Thermometer; but they knew that houses built in low places were warmer, so far as the sensations of the inmates were concerned, than those placed on or near the summits of hills. Hence we find that very many of the old manor houses occupy low and sheltered situations. At the present day we have quite forsaken the example of our ancestors in most things, and it is not to be wondered that we have forsaken it in this also. If the Asylum were to be used by people in perfect health, nothing need be said against these hill-top sites. They would, for instance, be admirably adapted for Barracks or Schoolhouses, but for Lunatic Hospitals, I am satisfied that the principle has been carried too far, more especially in the Asylums for the northern districts of England. These bleak, exposed sites render the buildings much more difficult to warm, and the out-door recreation of the more feeble patients has to be greatly curtailed. I would, therefore, advise that an Asylum be built on ground with just sufficient rise to permit of easy and perfect drainage, and the building should be sheltered, from the north and east at all events, by higher ground and by thick belts of trees placed not too near it. The ground to the south should be entirely open, and the building should face almost due south. As it seems undesirable to allow too great a conglomeration of men under one roof, I would limit the size of an Asylum to seven hundred or eight hundred beds, or to one thousand at the very outside. The ground on which the building stands, and as much as possible of the surrounding land should be subjected to deep sub-soil drainage.

In height, the building should not exceed two stories. The walls should be either hollow, or lath and plastered inside—the latter preferable. Some modification of the block principle of construction should be adopted, and dayrooms and dormitories should be so planned that efficient cross ventilation can be readily carried out in them.

WATER SUPPLY.

The water supply is a matter of primary importance, and it ought to be sufficient to allow thirty gallons a day to each person resident. If the water be hard, it should be passed through one of the many softening machines now in use for the purpose. To drink water containing much carbonate of lime can hardly be conducive to the general health or welfare of the patients, and it is more than probable that it is a positive cause of disease in some people. The rain-water falling on the roofs of our County Asylums is fairly pure, and some simple means of filtration, such as Curzon's filters, would probably render its use perfectly safe.

WARMING.

Perhaps the most important part of the Hygiene of an Asylum is that which pertains to the warming of the wards; and after having devoted much attention to the subject, I am sure that open fireplaces, occasionally supplemented by other means, are still the best, in fact, the only wholly satisfactory means. In using the open fireplace, we imitate Nature, inasmuch as the rays of heat from the fire resemble the rays from the sun in passing through the air without appreciably warming it. Air can only be warmed by coming in contact with warm bodies. All other methods actually warm the air which we breathe, and to inhale this warm air constantly must have an injurious effect on the animal economy. Of course I speak of air warmed unduly. That slightly warmed air may be breathed without ill effects there can be no doubt, and although I am not able to say what degree of temperature may be safely inhaled habitually, I am confident that it is much lower than is generally supposed. If anyone doubt this, let him contrast the cool invigorating sea breeze, bringing health and life on its wings, with the hot air from the desert, laden with disease and death. Probably the different amount of ozone in these may account for something, but not for all, nor nearly all. Again, in those countries where rooms are warmed by enclosed stoves or by coils of hot-water pipes, we are likely to find a high relative proportion of lung affections, and a tendency among the people generally to listlessness and inactivity, sure to induce some form of disease unless counteracted by out-door exercise. In America, for instance, phthisis is commoner than in England, and Mr. Leeds, in a treatise on ventilation, published at New York, declares that this heated air "is the great curse of the American people. It is that dry, lifeless, withering, debilitating poisonous stuff with which most of our best houses and public buildings, and, most unfortunately, many of our schoolhouses too, are filled and warmed, and which is filling our systems, and warming and drying the life and substance out of about two-thirds of the people of this country."*

Open fireplaces are, however, expensive methods of warming, and entail much trouble if they have to be kept up during the night It is, therefore, desirable to supplement them by some other method, and no other plan has answered so well in my hands as one of the numerous modifications of the slow combustion stoves. These stoves are cheap—at least, compared with hot water apparatus—very economical in the consumption of fuel, and undoubtedly effectual. They can be kept up with the slightest attention during the night (in fact, the larger sizes will need no attention at all for 12 or 14 hours), and even in the coldest weather the patients when they leave their dormitories find a fairly well-warmed atmosphere in the dayrooms before the open fires have had time to burn up. I should say here, for the information of those not familiar with Asylums, that the vast majority of the patients are out of bed during the day; differing in this respect from the inmates of Hospitals.

Corridors of communication, dining-halls, chapels, and all other parts not used much by patients may be warmed solely by enclosed stoves, as no injury is likely to result during the short time these places are occupied, and of course they need not be warmed beyond a safe point. In single-bedded rooms, occupied by lunatics, open fire-places can rarely be trusted, and it is hardly too much to say that no really good method has yet been invented to effect the purpose. Where the single-bedded room adjoins the nurse's room or corridor the warming can readily be effected by the use of a tubular fire-back in the nurse's room or corridor, or by conveying the warm air from a George's Calorigen, or by a grating in the recess wherein is placed a slow combustion stove. I have tried all these, and find them all efficient. The real difficulty exists where single bedded rooms are placed in rows. Here we must fall back on steam or hot water. All or any of these methods are not only justifiable but imperative, inasmuch as heated air is less injurious to an invalid than a very low temperature, and it is always advisable to choose the least of two evils. This is no departure from the principle I have stated, and I repeat that wherever the open fire can be safely used, it should be used as being at once the most natural, the most cheerful, and as a great help to ventilation.

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*Stevenson's House Architecture. Vol. II., page 219.

VENTILATION.

Next in importance to warming an Asylum, or rather running parallel with it, is the system of ventilation pursued. It is generally easy enough to warm a building by one or more of the means named in the preceding paragraphs, and it is not at all difficult to ventilate it; but when warming and ventilating have to be combined, as they must be for eight or nine months every year in our English climate, we find that the question of admitting pure air involves a problem not always easy of solution. We have all been taught at college, but we are apt to forget it afterwards, that a man exhales one hundred and sixty grains of carbon every hour, upwards of thirty ounces of watery vapour are given off every twenty-four hours, and to retain the latter in vapour, two hundred cubic feet of air are needed every hour. When the carbonic acid exceeds 1.5 per thousand volumes, it is very apt to cause unpleasant symptoms, and although very dangerous in itself, it is an index of other impurities, such as organic effluvia. The cubic space allowed in Asylums is six hundred feet in dormitories, and four hundred and eighty in day-room per patient; but the infirm wards are supposed to have rather more cubic space. If we admit that the maximum impurity permissible is ·7 of carbonic acid per thousand volumes, then, as pointed out by Wilson in his book on Hygiene, two thousand cubic feet of fresh air must be supplied every hour to each patient. Three thousand cubic feet would be necessary in the infirm wards, and more would be desirable. We therefore arrive at the fact that it is necessary to renew our six hundred feet of sleeping air at least four or five times every hour. Now, how is this to be done? In American Asylums the ventilation by fans worked by steam power is one of the usual plans employed, while in England it is never used, being, in fact, unnecessary, as we are fortunately free from the extremes of temperature common in the States. During the summer months the time-honoured custom of opening windows for the renewal of the air answers well enough, and if the windows are constructed, as they always should be in Asylums, with a fanlight at top, no draught need be experienced. As it is desirable to move the air on the floor line, there ought to be several gratings in the skirting-board fitted with sliding shutters. During the colder months, open windows and gratings are to the majority of patients almost unbearable, and it must be remembered that in many of the insane the nerve force is low, causing changes in the temperature to be easily felt and badly borne. At the same time, if health is to be maintained, our two or three thousand cubic feet of fresh air must be supplied. The Manchester grate-back, and the tubular grate-back already referred to, amdit a very considerable amount of warmed fresh air, but supposing a ward contains sixty patients and has, in addition to the stoves, four open fireplaces fitted with either of these contrivances, it is clear that they will not admit the required hundred and twenty or hundred and eighty thousand cubic feet of air every hour, and making allowance for what passes through the badly fitting doors and windows, they must be supplemented by other means. In some Asylums warmed air is drawn into the wards through gratings placed in a juxtaposition to coils of steam of hot water pipes, and this system is said to answer fairly well. Tobin's tubes form a very ready means of introducing fresh air. They possess the great advantage that they may be easily fitted to any building, and they may be closed at pleasure. For extracting the vitiated air, many inventions have been tried. A system of pipes carried from the various rooms, gathered into a larger pipe in the roof of the building and ending in a flue, at the base of which is a powerful gas jet, answers well, and is really most useful in heavy, moist weather, when the external air seems almost stagnant. Sometimes these pipes join the main chimney flues, or they may be conducted close to the part of the roof in which the hot water tanks are placed. Flues constructed in the chimneys alongside the smoke flues act fairly well, so long as the adjoining fires are being used. These flues should open close under the ceilings, and down draught may be prevented by an Amott's valve. Perhaps we lay too much stress on the extraction of vitiated air by special means. If fresh air be freely admitted, there is not much fear but that the foul air will find its way out.

DRAINAGE.

The drainage of an Asylum may conveniently be divided into three stages. First—within the building; second—beyond the building; and third—its disposal. Within the building, by far the most important point for consideration is the arrangement of the closets. These should be in a small block by themselves, merely connected with the ward by a passage. This passage need not be long, indeed, it is better short, as being less likely to act as a flue. Some modification of the Unitas w.c. pan would seem to be the best. I prefer those made of enamelled iron, and the basin and trap should be cast in one piece. The afferent pipe should pass straight from the trap to the soil pipe, never burrowing under the floor as is so commonly found. As the insane often put articles of clothing and brushes down the closets, the trap should be fitted with a brass screw plug about two and a half or three inches in diameter. The soil pipe should invariably be placed outside the building. It should not be less than four and a half or five inches in diameter, and it should run up about four feet beyond the eaves. The lower end should terminate in an inspection pit covered with an airtight lid to prevent escape of sewer gas. It is sometimes recommended to have the lid perforated, but this is clearly a mistake, as sewer gas will pass into the open air close to the building, under the level of the windows, and is certain to be drawn inside the Asylum. A trap at the distal end of the grating would prevent this, but a trap in the continuity of a drain is very likely to be often obstructed. The main drains should be of glazed sanitary pipes, first of six inches diameter, then of nine inch, and finally of twelve inch. Brick culverts are not desirable. When well clear of the building, the main drain should be ventilated, and a nine-inch pipe should connect the highest point of the drain with the main chimney. This will ensure the gas in the drain being drawn up; probably decomposed, and certainly dispersed in the air at a height free from all danger. The baths and slop sinks must be carefully trapped, and should deliver on to open gullies also trapped. It is a good plan to arrange the baths so that the waste water flows into the inspection pit of the closet, and thus frequent flushing of the drain from its origin is certain to take place. In spite of every care which can be taken, sewer gas will sometimes penetrate the building; and to aid in the detection of the faulty point, Paine's Drain Rockets may be used. The main drain should be conducted several hundred yards from the Asylum and into a depositing tank, where the solids are left, and whence the liquid part flows straight on to the land to be irrigated. It is said that the excretæ of each individual are worth about seven shillings and six pence per annum, and we await some discovery whereby the chemist can transmute them into gold. In the meantime we must be satisfied with some system of disposal which is without danger to the lives of those living near, and if profitable so much the better. One author tells us that sewage passing on to the land evolves a considerable amount of ozone. If this be so, we may one day find that the neighbourhood of sewage farms will become a favourite site for residences. We know that consumptive patients have ere now been advised to breathe the vitiated atmosphere of a cowshed. The air of gasworks has been prescribed in some spasmodic diseases, and it would be strange if sewage shouldn't have its virtues praised for one of the many ills of life.

BATHS.

It used to be said, perhaps it is still held by some, that the insane exhale a peculiar odour, and that by it alone the disease may be diagnosed. That there is such a thing as the Asylum odour is true; but that it is peculiar to the insane, or at least to any considerable number of them, I have the greatest doubt. At any rate, whatever be the smell, it shows that the skin is not properly discharging its functions, and indicates the necessity for frequent ablutions. Hence the bathing arrangements should be on the most liberal scale. Considering the value of the Russian and Turkish Baths as therapeutic agents, it is strange that they should be so little used in our English Asylums. It is questionable whether one-fourth of them are fitted up with these adjuncts, which I look upon as absolutely necessary.

CLOTHING.

As already stated, the nerve-force of the Insane is often low, and they are easily affected by changes of temperature. Hence their clothing should be light, yet warm and sufficiently porous to permit of free exhalation from the skin. The underclothing should be of such material as will be a safeguard against chills, and also such as will permit of easy and frequent washing. The same applies to bed-clothing.

FURNITURE.

The furniture of an Asylum should be strong and comfortable, and the coverings and stuffings of seats ought to be made of some non-absorbing material. Carpets should not be much used. The floors, if of oak or pitch pine, may be rubbed with the old-fashioned beeswax and turpentine. If of common wood, they may be laid down in linoleum, or simply stained and varnished. Either of these plans will render the floors impervious, and obviate the necessity for frequent scrubbing and washing. The constant scrubbing of floors, and the evaporation of water consequent thereon, are scarcely in harmony with correct ideas of hygiene. Curtains and hangings should be sparingly employed, but where the windows are made with hopper fanlights, short curtains or valances may be used with advantage, as when the hopper is open the curtain will direct the fresh air towards the ceiling, whence it will fall down in a gentle spray, and no draught will be felt. Whatever wall colouring be used, it should be either susceptible of frequent renewal or be of such material as will not spoil by washing. Varnished paper or the new wall covering known as "Tectorium," fulfil the last named condition.

FOOD.

So far, then, we have housed the patient, warmed him, have given him pure air to breathe, and clothed him comfortably; but all these would be unavailing without a sufficient supply of wholesome food. An adult man doing a moderate amount of work—and no lunatic ever does more than very moderate work—needs about four and a half ounces of nitrogenous food, and about thirty ounces of carbonaceous food daily. In all Asylums the ordinary diet for patients is regulated by the visiting Justices. It is always sufficient, and in some

Asylums it is above the standard required by authorities on dietetics. The consumption of alcoholic drinks has of late years been greatly reduced in many Asylums. In some it has been totally given up as an ordinary article of diet, and in others it is limited to a little table beer, given rather as a reward to those who work than with any idea that it is in any sense a food. Even as an adjunct to the diet of the sick, it is much less used now than formerly. One Medical Superintendent stated in his Annual Report for 1887, that "the use of alcoholic stimulants in the treatment of diseases, and as an addition to the diet of the feeble and aged, was gradually and almost completely discontinued. In this change there can be no doubt we made a decided advance in rational treatment." The Infirmary diet is left to the discretion of the Medical Officers. There is consequently no danger of error on the side of insufficiency. Cases of acute insanity are, as a rule, feeble and emaciated when admitted—sometimes to an extreme degree—and as convalescence approaches, the diet needed is far in excess of what any scientific diet scale states to be necessary.

EXERCISE.

A Paper treating of Asylum Hygiene would be incomplete without some reference to physical exercise. As I have reached the limit of time allowed, it will be sufficient to mention that, excepting the more violent of outdoor games, all others are indulged in and are useful in maintaining physical health and in promoting mental recovery.

LEGISLATION FOR THE PREVENTION OF MILK INFECTION,

By SHIRLEY MURPHY, Esq.

THE subject of legislation for the prevention of milk infection concerns not only rural districts in which milk is produced, but urban districts in which it is consumed, and experience has shown that a town in which every precaution has been taken to ensure the health of the inhabitants may suffer from the distribution of an infected milk supply, over which the community has no control.

The measures that may be taken for its prevention must necessarily be modified, as more exact medical knowledge is gained of the circumstances under which it is caused, but already there are indications, and more than indications, of the lines upon which legislation should proceed. Recent investigations have shown the insufficiency of existing legislative powers for the protection of the milk consumer from disease conveyed in this article of food, and it is right that in view of the injury from time to time caused by milk, the law should be strengthened to protect the public health as far as is possible.

It is little more than thirty years ago that the fact was first demonstrated by Dr. Michael Taylor, that milk could act as a vehicle for the dissemination of infectious disease, and a still shorter time since Dr. Taylor's conclusions were generally accepted. I may presume that the frequent repetition of outbreaks of disease traced to this source has now placed beyond the doubt of all, the part which this article of food occasionally plays as a cause of injury to health. But beyond this, there has been in this period a considerable change of thought as to the circumstances which may give rise to milk infection.

Until comparatively recently it was generally held that milk-scarlet fever and milk-diphtheria were due to contamination of milk by human agency, such as a milker or milk carrier suffering from the malady, or by infection conveyed by him from some other person with whom he was associated. Milk-typhoid was thought to be caused by infection of milk with water itself specifically contaminated. The measures, therefore, which the law prescribed for the prevention of milk infection were based upon these views. That is to say, the Contagious Diseases (Animals) Act of 1878 empowered the Privy Council to issue general or special orders for regulating the sanitary condition, including water supply, of dairies and cowsheds, and for securing the cleanliness of milk-stores, milk-shops, and milk-vessels, used for containing milk for sale, and for prescribing precautions to be taken for protecting milk against infection or contamination; while local authorities were authorised to make regulations for these and other purposes subject to such conditions as the Privy Council should prescribe.

The Order which the Privy Council issued in the following year rendered it unlawful for the cowkeeper, dairyman, or purveyor of milk, to allow any person suffering from dangerous infectious disease, or having recently been in contact with a person so suffering, to milk cows, or to handle vessels used for containing milk for sale, or in any way to take part or assist in the conduct of this trade or business, so far as regards the production, distribution, or storage of milk; and lastly, the milk of a cow suffering from certain diseases specified by the Act, was not to be sold or used for human food, or sold or used for food of swine, or other animals, unless and until it had been boiled.

Since the passing of this Act, and the issue of the Order of 1878, there has been further legislation by Parliament, and the issue of further Orders by the Privy Council; but this has done little more in respect of the matter under consideration, than give increased powers for the improvement of the house accommodation of the cow, and of the water supplied to her therein. As yet, the only diseases of the cow thought worthy of legislative control are these specified in the Act. In the meantime medical thought as to the cause of milk infection has undergone a very considerable modification.

It had for some time been seen that the theory of infection of milk by human agency in the way usually accepted, failed to afford adequate explanation of an outbreak of milk-scarlatina extending over a lengthened period. If such contamination were to be held responsible for such occurrence, it was obvious that this contamination must have taken place day by day during the whole period, and the circumstances were not such as to justify the belief that this could have occurred. Mr. Power's investigation of the outbreak of scarlatina communicated by milk from a farm at Hendon, supplied the evidence that was wanting in support of the view that milk infection did not necessarily depend upon contamination received after it had left the cow. The striking agreement between the movements of certain cows recently arrived on the farm, and the appearance of scarlatina among certain sections of the milk drinkers raised so strong a case, that apart from the evidence contributed by Dr. Klein as the results of subsequent experiments, it afforded strong ground for the conclusion that a cow malady, an eruptive disease, was responsible for the milk infection.

The controversy to which the publication of Mr. Power's and Dr. Klein's papers has given rise may be cited as affording convenient illustration of the strong hold which the commonly accepted theory of milk infection has upon many minds. It is unnecessary to follow this controversy in detail, but it will be remembered that those who have held the view that this infection must have been due to human agency, have, in support of their contention, urged as sufficient explanation of the outbreak of disease among the milk-drinkers, the possible visits to the cowsheds of a lad who lived at a distance from this farm, and who resided in a house in which scarlatina occurred. It has been pointed out, however, that the visits to the farm of this boy are denied by the farm bailiff, and if they occurred at all, they would have afforded no sufficient explanation of the circumstances of the scarlatinal prevalence.

The more closely the history of this outbreak is considered, the stronger does the evidence appear that the cows must be held responsible for the infection of the milk, and again, the more closely the theory of infection by human agency is considered, the less does it appear to satisfy the requirements of a daily infection of milk. Indeed, we may go further than this, and insis that we have no exact medical knowledge that milk infection has ever occurred in the latter way.

Altogether, apart from the risk of scarlatinal infection of milk from the udder disease of the cow, there are very weighty reasons for regarding all communicable udder affections of this animal as prejudicial to the milk drinkers. Professor Brown has well described the condition of milk from a cow suffering from the so-called Wiltshire disease, the pus and other morbid products it contains; and all medical men will agree with him in the impropriety of allowing milk thus contaminated to be used for human food. Again, whatever views may be held as to the difference between bovine and human tuberculosis, no one would approve of the sale for food of milk from a cow suffering from tuberculous disease, yet at the present time there is no legal restriction of the distribution of milk containing pus and tuberculous products.

We may, therefore, not unreasonably claim that the Legislature which has already prohibited the sale of milk from cows suffering from certain specified diseases, and has prescribed precautions for the prevention of contamination of milk by human agency, should extend these measures so as to include those other conditions to which I have referred. Certain of the powers that already exist for limiting the extension of the specified diseases would be found to serve a useful purpose, if the meaning of the word "disease" were extended in the direction indicated.

Section 31 of the Contagious Diseases (Animals) Act of 1878, requires that every person having in his possession or under his charge an animal affected with disease, shall, as far as practicable, keep that animal separate from animals not so affected, and shall, with all practicable speed, give notice of the fact of the animal being so affected to a constable of the police establishment for the police district or area, county, borough, town, or place wherein the animal so affected is.

The Local Government Act of last year transfers to the County Council "the execution as local Authority of the Acts relating to contagious diseases of animals."

If, therefore, the word "disease," for the purposes of Section 31 of the Contagious Diseases (Animals) Act were made to include eruptive diseases of cows and tuberculosis, the County Council would be informed of the occurrence, and would be able to ensure that the extension of the disease to other cows was prevented, and that the milk was not sold for food for man.

It will be recollected that by the Contagious Diseases (Animals) Act of 1886, the powers vested in the Privy Council of making general or special Orders under Section 34 of the principal Act for the purpose mentioned in that Section were transferred to the Local Government Board, and it was enacted that the expression "Local Authority" in that Section was to mean (except in the Metropolis) the local Sanitary Authorities. Section 34 of the principal Act now gives these Authorities the right to inspect cattle, but beyond this, their duties mainly relate to the sanitary condition of cowsheds, etc., and to the enforcement of measures for the prevention of infection of milk by human agency. They have no powers, either, to require the isolation of an animal suffering from certain specified diseases. But in this right to inspect cattle, a duty which I presume should be performed not by the ordinary Sanitary Inspector, but by a veterinary surgeon, there is implied some concern on the part of the local Sanitary Authority as to the health condition of the cows. Now undoubtedly the question of disease among the milk drinkers having its origin in contaminated milk is matter of concern to the local Sanitary Authority, and the right to inspect cattle in dairies leads to the expectation that some further proceeding should on occasions result from the inspection.

Confusion would arise if any attempt were made to divide cow diseases into two classes, and to provide that one of them (those specified in the Act) should come under the County Council, and the other (eruptive, etc.) under the District Sanitary Authorities; perhaps the most convenient arrangement would be for the duty to be put upon the officer of the District Sanitary Authority to notify any unhealthy condition to the County Authority, and to leave that Authority to deal with it. On the other hand, any knowledge possessed by the County Authority of the existence of eruptive disease in cattle should be notified to the District Sanitary Authority, for the information of the local Medical Officer of Health, who would at once ascertain whether it had any relation to existing human disease. Indeed, the shortest plan would be for the cow-keeper to be required to notify both to the County and District Authorities any such unhealthy condition observable in his cattle. The information given to the County Authority—whom we may expect to have the services of a Medical Officer of Health—would be especially valuable when the milk had been distributed in more than one district.

A further power we should desire to see exercised in respect of cattle suffering from eruptive diseases is that which would prohibit their movement without sanction from the Local Authority. This power already exists in regard to cattle suffering from the specified diseases, and should not be limited to them, and should further extend to all cattle on a farm, the milk of which is under suspicion of having caused infectious disease in man. Experience has shown the necessity for such prohibition, for a cow-keeper has been known to dispose of his cattle at a time when the milk from his farm was suspected of communicating infectious disease to those who consumed it.

Among the regulations which a District Sanitary Authority may make under the Order of 1885, is that of prescribing precautions to be taken by purveyors of milk, and persons selling milk by retail, against infection or contamination. What is now needed, however, is the power to make regulations which should apply to cow-keepers, and go beyond the evident intention of both Act and Order, and permit of the regulation of the business of cowkeeper in such a way as to limit the probability that his herd should be attacked by eruptive disease. There are two points which should be covered in any regulations made. The one relates to the introduction of diseased animals, the other to its spread. The first could be prevented if newly-purchased cattle were not placed immediately among the rest of the herd, but were quarantined for a month before being allowed to mix with others. If they should exhibit signs of disease, the quarantining should be maintained until recovery is complete. During this period they should preferably not be milked by the same person who is employed to milk the other cattle, or should be milked after them. The second would be prevented if the milker was required to wash his hands and wipe them between the milking of successive cows. This last practice is carried out in Denmark, and on some farms in England, I am told also in some farms in Scotland, and is found to give protection against diseases of this kind. A regulation requiring that the cow should be maintained in a proper condition of cleanliness is also much needed. At the present time there is often no sufficient attempt to prevent the dirt which collects on the teats from entering the milk pail, and for aught we know, seeing that this dirt is often excremental in its character, it may have important relation to disease in man.

Briefly then we may sum up our requirements for :—

1.—The quarantining of newly-purchased cattle.
2.—The maintenance of cleanliness of the hands of the milkers for the prevention of infection thereby.
3.—The maintenance of cleanliness of the cow.
4.—The notification to the Local Authorities of eruptive disease of the cow.
5.—The isolation of animals so diseased.
6.—The prevention of removal of animals so diseased.
7.—The prevention of removal of animals when the milk is under suspicion of having communicated infectious disease.
8.—The prevention of the sale of milk when the milk is thus suspected.

If objection should be taken to a proposal to regulate such details of administration, it may be pointed out that they are of serious import in relation to the prevention of the contamination of milk, and that their regulation provides a considerable security against possible causes of mortality to man. Regulations, moreover, are, if judiciously enforced, educational in their effects, and this perhaps is their greatest value. Those stated make no unfair demand upon the cow-keeper, and some of them are already adopted on farms supplying milk to the more careful of the retail vendors.

While pleading for increased legislative control over matters relating to the health of the cow, we may ask that these may extend to conditions beyond the limits of the cow-shed. At the present time there is no statutory power for requiring a wholesome water supply for the cows in the meadows. Those who are conversant with English farm life are well aware that during the summer months the cows remain in the fields day and night, only coming to the sheds for the purpose of being milked. In many farms there is no other water supply for their use than that which is found in hedgeside ditches or in stagnant ponds, which readily become fouled by the animals.

In our present state of knowledge we are unable to say to what extent water polluted in this manner may be prejudicial to their health and indirectly to the drinkers of their milk, but if we were to generalise from our knowledge of the effect of water excrementally polluted upon the health of human beings, we should undoubtedly require an unpolluted water supply for the cattle in the meadows as well as in the sheds. No doubt in many farms there are serious physical difficulties in the way of such a requirement, but it must also be admitted that every farm is not fitted for the production of milk, and if this demand could be enforced by law, I do not question but that some means would be found for meeting it in a sufficient manner.

In conclusion, I would desire to say that I do not profess in this short paper to have treated the whole subject exhaustively, but I have endeavoured to indicate the chief lines upon which legislation might proceed. It will be a source of satisfaction to me if the conclusions to which I have directed attention should meet with your approval.

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SUGGESTIONS FOR A GOVERNMENTAL SURVEY.

GEOGRAPHICAL SURVEY OF DISEASE IN THE BRITISH ISLES,

By ALFRED HAVILAND, M.R.C.S.

I. In 1839, when the act for registering Births, Deaths, and Marriages in England came into operation, the late Dr. William Farr, C.B., F.R.S., in his very first letter to the Registrar-General made the following significant statement :—

"The registration of the diseases of the several districts will furnish medical men with a series of valuable remedial agents. It will designate the localities where disease is most rife, and where there is the most tendency to particular classes of sickness and infirmity. In recommending a residence to patients, the physician will find the registered causes of death an indispensable directory; and the utility of a Sanitary Map of the country, such as the returns will furnish, cannot fail to be felt in England, where a part of the population is constantly migrating from place to place in search of health."

In 1864, Major Graham, the late Registrar-General, published Dr. Farr's letter and tables on "The Causes of Death in England and Wales during the ten years 1851-1860 among males and females, separately and at different ages" as a "Supplement to his 25th Annual Report." In this remarkable report, which achieved for the Department an European fame, there were tabulated for each of the 630 registration districts, and for males and females separately, certain special diseases and groups of diseases as follows:—Small-pox, Measles, Scarlet Fever, Diphtheria, Whooping Cough, Typhus, Cholera, Diarrhœa and Dysentery, and other zymotic Diseases; Cancer, Scrofula Tabes Mesenterica, Phthisis, Hydrocephalus:—Diseases of the Brain, Heart Disease, and Dropsy, Diseases of the Lungs, Diseases of the Stomach and Liver, Disease of the Kidneys, Diseases of the Generative organs; Diseases of the Joints, Diseases of the Skin, Child-birth and Metria; Violent Deaths, and Other Causes. The number of deaths from each cause registered at each age-period, and for each sex separately, was given in the age-period columns, which contained at their heads the mean populations of males and females separately at each age-period. With such data, Sanitary maps such as Dr. Farr shadowed forth in the words I have just quoted became possible.

In 1868, aided by the kind co-operation of Major Graham, Dr. Farr, and Captain Clode, I began to carry out the Geographical Distribution of Disease, in accordance with the data just described. Between the publication of the first supplement in 1864 and the second supplement in 1875, I had published at the cost of great labour and expense, the Geographical Distribution of Heart Disease amongst males and females; Cancer among females, and Phthisis among females—and had had prepared a large copper plate on which each of the 630 registration districts were organised on a scale of 12 miles to the inch.

Since the publication of these maps, two of which illustrate this paper,* I have continued up to the present time to pursue the same studies.

In 1875, when Dr. Farr's second supplement for the ten years 1861-70 was published, I then added the death rates of the second ten years to the maps published, but found that in the case of heart disease, cancer, and phthisis, this addition only corroborated what was shown to have obtained in the first decennial period.

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* These Maps were exhibited at the time the Paper was being read.

Having now 20 years' statistics of the deaths from certain specified causes among males and females separately, I constructed maps of small-pox, scarlet fever, diphtheria, whooping cough, typhus, cholera, diarrhœa, dysentery, scrofula, tabes mesenterica, phthisis, hydrocephalus, and child-birth; as for diseases not included in the list above given, as contained in the supplement, I have also mapped the Geographical Distribution of fatal calculus and fatal gout among males and females, and ovarian dropsy. I have also constructed maps showing the Geographical Distribution of heart disease, phthisis, cancer, and diseases of the respiratory organs in Scotland. I have studied these diseases in the Isle of Man, and have coloured them in accordance with the maps of Great Britain.

In 1874 I constructed a map showing the Geographical Distribution of Deaths by Lightning, which revealed some unexpected coincident facts.

After seventeen years working at the two supplements of Dr. Farr, for the two decennial periods 1851-60, and 1861-70, which throughout the civilized world were, and are still, regarded as models of reports, I naturally and anxiously looked forward to the present Registrar-General's Supplement to the 45th Annual Report, as I had determined when 30 years' statistics had been published of death amongst males and females at different age-periods from certain specified causes, to complete the maps that I had not yet published, and to add twenty years to those which illustrated my large folio work on heart disease, cancer, and phthisis.

In 1885 the present Registrar-General issued his supplement for the ten years 1871-1880, and one short glance at it revealed the astounding fact that he had thought proper to ignore the principles so rigidly insisted upon by Dr. Farr, and so wisely and loyally carried out by his predecessor, Major Graham. In fact, the present Registrar-General, in this supplement, had presumed to do away with the distinction of the sexes, an essential in all vital statistics as Dr. Farr had demonstrated over and over again in his classical reports, and had rendered worthless the vast accumulation of facts collected in his office at a great expense to the nation, by mixing up the deaths, ages, and populations of males and females under the composite term "persons," so that the causes of death peculiar to either sex can no longer be studied; for instance, cancer, which is twice as prevalent among females than it is among men, can only now be studied by the light of the data given by Dr. Farr, and now nearly twenty years old. Again, the deaths from child-birth, etc., are so inextricably mixed up with male deaths, and ages, and population, that this important cause of death is practically struck out from the list of specified causes; for without data it is impossible to separate the males from the females. We all know that some diseases are more prevalent among males than among the opposite sex, and therefore, like cancer, should be studied separately. All such diseases are now in the same category as child-birth, and for all useful or scientific purposes have been ruthlessly and ignorantly expunged from this defective report; the author of which tells us that all this has been done "to meet the practical requirements of the Medical Department of the Local Government Board!"

On this painful subject I shall say no more at present, but content myself with referring the members of this Congress to my papers on "The Geographical Distribution of Cancerous Diseases in the British Isles," published in *The Lancet* during the end of February and beginning of March, 1888; and to the correspondence with the General Registrar Office in *The Medical Press* of September last.

II. At a General Meeting of the International Medical Congress at Copenhagen it was resolved to appoint a Committee to carry on in an international manner the system of collective investigations. One of the objects of which was that my works on Medical Geography should be made much more widely known: by which it was hoped that the Committee would be able, with the co-operation of medical men in all parts of the country, to extend my observations and to confirm or connect them with the facts which it collected.

This Committee investigated "Cancer of the Breast," and the report was drawn up by Mr. T. H. Butlin, F.R.C.S., of Bartholomew's Hospital, and published in the *British Medical Journal*, 26th February, 1887. The distribution of diphtheria, cholera, etc., was also undertaken, but not on the same lines as my enquiries.

I am of opinion that at present it would not be desirable to extend the number of diseases beyond those named by the late Dr. Farr in his two supplements. These should be exhausted first, but before this can be done, the defective supplement of the present Registrar-General for 1871-80 must itself be supplemented by the publication of a decennial report for this period, framed on the models left by their author, the eminent statistician just named.

Whilst, however, I would not advise the addition of other causes of death to those referred to, I certainly do strongly advise the careful study of some diseases which seem to be associated with the more fatal ones—for instance, whilst studying the distribution of heart disease, we should acquire as much information as is possible relating to those low forms of rheumatism which infest the valleys of Great Britain, where heart disease is most prevalent. Again, the late Sir Erasmus Wilson was strongly impressed, on studying my maps at the Royal Society, with the necessity of studying phthisis in connection with cancer and lepra; hydrocephalus, mesenteric, and other diathetic diseases should all be grasped in our minds when investigating scrofula and phthisis, and as much information acquired about them as possible. I certainly should like to see ovarian disease, gout, and calculous affections added to the list, as I feel sure from investigations that these causes of death have some unexpected results in store for those who will undertake thoroughly to investigate them.

However, it must be borne in mind that until the Decennial Supplement for 1871-80, has been published, containing the deaths of males and females, at certain age-periods, together with their mean numbers for each age-period in each of the 630 districts of England and Wales, it would be useless to undertake a geographical survey of disease in this country.

III. We next have to consider the staff that would be required to carry out the geographical survey of disease. In the first place, after the experience we have lately had, and to which I have just referred, it will be of the first importance that we should secure the services of a Committee of Members of both Houses of Parliament, whose duty it shall be to see that the work at the General Register Office, as regards births, deaths, and marriages, is efficiently carried out, and to endeavour to urge upon the Government the necessity of in future insisting upon quinquennial reports or supplements. Secondly, it will be necessary to secure the services of members of the Geological Survey of Great Britain, members of the Royal and Scottish Meteorological Societies; members of the Statistical Society, and a selected number of medical men, well versed in sanitation, geology, chemistry, microscopy, botany, and biology. Members of the Army Medical Department, whose varied experience throughout our country at the military stations, would, I know, prove to be invaluable additions to the staff.

IV. The next question for us to discuss is: What department of Government should undertake this Geographical Survey of Disease? In the time of Major Graham and Dr. Farr, the answer would unhesitatingly have been—"The General Register Office," but our experience now tells us that it would be fatal to success to trust to a department that has so signally failed in its duty. And the Medical Department of the Local Government, as the alleged instigators of the fatal blunder complained of, would be equally ineligible for such a high and important trust. These remarks do not, of course, apply to the General Register Offices of Scotland and Ireland, both of which departments would render invaluable aid to the proposed survey.

The proposed work is essentially a home work, and I certainly think that in the first place the whole subject should be laid before the responsible Ministers of the Crown, and their advice and opinion sought as to the first step to be taken,—as to whether they will support the movement, and undertake, with the help of the promoters to organise a special department for the Geographical Survey of Disease, and sanction the organization of a staff to carry out its objects.

V. The results that such a comprehensive investigation, would, in the sequel, bring forth, will be manifest to all who have studied the natural history of disease. We have yet much to learn about such terrible diseases as cancer; we have also much to learn as to the influence of soil as a factor in the production of many diseases. The sites of our military stations, scattered throughout the British Isles, both as to soil and climate, have not yet been studied with a due regard to the health of our troops who are stationed on them. The investigation promises to lead us to the selection of more appropriate sites for the habitation of our vastly increasing population, of which the labouring classes form so important a section; more appropriate resorts for the diseased and those threatened with disease; and the construction of that "Sanitary Map of the Country," which the foresight of the Father of Vital Statistics, William Farr, predicted in 1837 would some day become a possibility, if the work, which he initiated and successfully carried on for forty years, were faithfully and loyally continued by his successors.

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DEATH RATES AND THE CENSUS,

WITH SUGGESTIONS FOR AN ANNUAL LIFE VALUATION,

By SIR EDWIN CHADWICK, K.C.B.

In commerce and in manufactures, as in every large company, there is annual stock-taking, and upon that stock-taking a report and declaration of the results is made to the shareholders. But what is the state of the political administration, which has only attained to a stock-taking of the living people, of the healthy and the weakly, on whom the power and the prosperity of the country depend, which is only attempted every ten years, and is only completed in three years, leaving the numbers meanwhile to be got at by estimates, necessarily erroneous, often widely erroneous ? An annual census of the more numerous animal stock has been lately striven for and obtained, and is annually worked out by the Agricultural Department of the Board of Trade. It is some forty-five millions of the agricultural stock, while, according to the last decennial enumeration, the population of England and Wales was in round numbers twenty-seven millions seven hundred thousand. Other nations, as France and the United States, have halved the inconvenience of the stock-taking of the human population, and it is now proposed to halve it here by a quinquennial census. What in civil life and administration would be a quinquennial stock-taking and report? But I have the support of the greatest statists and administrators in Europe that an annual census is practicable, and that it is important for the improvement of public administration. I had the honour of being selected, along with the late Dr. Farr, as the representative of statistical science in England, in an official Congress, together with Quetelet, the leader of the statistical science on the Continent, and representatives from France, Germany, Italy, and Holland. There were about a dozen members of the Congress who held meetings annually in turn at their respective States, where they were received with distinction by their respective Governments. At the Congress held at The Hague, I proposed that a census should be taken annually, and as much as possible in one form in all the States. This proposition was strongly supported by Professor Engel, of Prussia. They were men who well understood that for facts of importance the recordations should be prompt to secure them for practical working. I was expected to develop the subject more fully at another Congress. But I was prevented attending the other Congresses, and I was remonstrated with seriously by the other members, who were fully prepared for the consideration of the subject, as a most important one. But Quetelet died; and the Congress itself, in that form of selected permanent heads of departments, was interrupted by the tempest of war, and has not been renewed in that state form.

The old method of taking the census decennially has prevailed; it is worked in England by one hundred patronage-appointed clerks, at an expense of £100,000, and occupies three years, resulting in a greatly changed population, and much error. My view was that the census, instead of being worked by a hundred extra clerks, for three years in London, should be accomplished annually, locally, by some six hundred and fifty superintendent Registrars, assisted by the Local Health Officer on the sanitary points requiring recordation, including the Poor Law officers, as respects the pauper population. The payment made of £100,000 might be transferred in its proportion to the local officers for the extra work of the annual report. The eligible course would be to select for the extra service that local officer, the exercise of whose functions occasions his visits to every house in the district. Should it be the rate collector, who might leave with his rate collection form a slip of census form to be filled up in part by the householder, and in part by the officer himself on inquiry? The rate collectors are not popular, and their enquiries are evaded. Should it be the postman, who visits most of the houses, and if not all, may visit all, and who could provide for the local post office a more complete directory of persons and names than at present exists? Or might it not be the agent of the new local authority, the School Board, who visits every house to inquire about the attendance or non-attendance of the children at school, and may make additional enquiries at the same time? These officers, as a rule, are stated to be highly intelligent men. The appointment of the most eligible officers, however, may be left to the local Registrar and the Clerk of the Union. The officer will have the dates of birth of every living person in a house, and, without troubling the occupier, he may insert of himself the addition of the year, and get answers to his inquiries into other particulars deemed necessary. There is one point I ascertained with respect to the Metropolis, and that is, the very large changes in the population by constant removals, even in the most prosperous periods. The electoral agent of the City of London, the late Mr. Sidney Smith, stated that the changes of occupiers of houses on the registration list as voters were at least twenty per cent. per annum. Mr. Kelly stated that the changes for his great directory for the whole of the Metropolis were fully twenty per cent. For his suburban registration he only enters occupiers of houses rented at £50 and above, and among these the changes by removals were about the same. But the changes of residence among the wage-classes, to follow and be near their work, appeared to be greater than of any other classes, and amounted to as much as one-third. The changes as respects children are extremely perplexing to school teachers. What must they not yet be in the operation on a quinquennial census?

The report of the stock-taking for a local administration would be such as to serve for its guidance, and may, I believe, be made of great annual interest to the ratepayers. It may serve to direct the efforts of the local authority to the gain in economy from works of sanitation; it would present to them, and to the localities, an interest in the incomings and the outgoings of different classes in their occupations, the proportion of the sick, and paupers, and dependents, leading to the consideration of their causes. I submit the following sketch of a stock-taking of a population, such as was appended to my report on "The Sanitary Condition of the Labouring Population," in 1842:—Total population in 1888; total population in 1889; total incomers and outgoers in 1889; dependents; sick; deaths; paupers. The proportion of deaths of children under one, or more completely under five years to the total deaths, we deem the best index to the sanitary condition of a place, as children are mostly on the spot, are most affected by the local sanitary conditions and the least affected by occupations, migration, or emigration. On looking over the returns for this healthy place, Hastings, and comparing the death-rate of children under five years of age of the higher classes, and the visitors with those of the wage-classes, we see that the deaths of children of the well-to-do are 3·41 to total deaths, whilst the death-rate of children under five years of the wage-classes is as much as 38·72 of the total deaths.

This denotes how much is yet to be done by sanitation for the wage-classes. When these children survive the juvenile period, they lose upwards of nine years as compared with the better sanitary conditioned classes. The causes of death are displayed in the further stages. Let Hastings be subjected to a clinical examination, such as was adopted by Brighton with much benefit, though as yet but half-used. It would cost less than half the expense of a local Act, which is commonly without science, presenting examples of the wastefulness of ignorance, unreduced death-rates, such as heavily burden the country. I believe that upon a close examination of the schools of Hastings, the means of ventilation and washing, a systematised inspection of workshops, as was provided in our regulations for the Officer of Health, and the aid of the sanitary inspectors, a further reduction of the death-rate from fourteen to eight in a thousand may be confidently anticipated, and a great pecuniary gain effected.

The value of a single life, according to the late Dr. Farr, is £159. Now a gain of six per thousand would be a gain to Hastings of 300 lives, and the money gain on these lives would amount to £47,700 per annum. Take the case of the wage-classes: What will be the money-value of six years more of painless life and working ability to them? To effect this money saving, there must be some expenditure for the attainment of at least a third-room tenement, for which the workman's gains in wages by the gain in health will abundantly pay. Hastings, however, has already gained largely by such imperfect improvements in sanitation as have gone on with little system. In the three years, 1847-9, I learn from the Registrar-General's Office that the mean age of all who died here was 30·7 years; but in the three years, 1885-7, the mean age of all who died was 37·5 years. There has, therefore, been a gain by sanitation, to all who have been born and lived here since 1847, of seven years.

Now, referring to the accustomed death-rates, as to which I have been challenged. The common death-rate accepted all over Europe at present is the rate per 1000 of the population. From what has been shown as to the changes of population in the most crowded districts, it will be seen how defective that must be. It is like taking the mean age of death of the fixed population of a regiment, one fourth or third of which is changed. Nevertheless, this rate, defective as it is, affords some indication of sanitary condition. I have, on observing two districts—one in which the houses were well drained, the other in which they were ill-drained—found the variations in this loose death-rate correspond largely with their conditions. The examples I have elsewhere cited of changes of sanitary conditions are accompanied by alterations in this death-rate, imperfect as it is. The annexed table, I may submit, is an advance to greater statistical accuracy, which ought to be required authoritatively. It was made up after much study by Dr. Richardson and myself, and implies separations into classes, the great differences in those classes, one contrasting with another, and displaying differences of condition belonging to each class, and requiring separate sanitary treatment. As the table stands at present, in the absence of any examination on view of the body, and so far as may be ascertained as to the causes of death by a competent health officer, proposed in my Report on Interments, of 1843, it is seriously defective as to the registration of causes, and as was proved, it let pass frequent cases of murder.

A STOCKTAKING OF THE POPULATION

on the conditions of the separate classes, and of their approximate treatment, would present a subject of interest to the ratepayers, as well as serve as a guidance to local administrators. Each locality would totalise its own report of the annual stocktaking, and send it to the Central Department, by which the whole of the local totals would be totalised; and the general result would be presented to the Government and the public in a few days. Giving due precedence to our chief subject, the economy of the public life and force, there would follow next another chapter on the pressure of destitution, and of the means taken for its relief—a Report by the Chief Poor Law District Inspector. I might state the fact that the cost of the service of some ten thousand paid officers, with all their defaults of organization, is at least three millions less now than the expenditure under the unpaid parochial officers, and that, on a full return to the principles we first laid down, a reduction of the present expenditure by one-half has been obtained. Our first principles of amendment set forth were that the functions left to the unpaid, the irresponsible, and the partially informed, should be supervisory only, like those of visiting Justices to prisons, and that the real responsibility should be left to highly qualified and skilled paid officers, as has been done voluntarily in the districts of Whitechapel and St. George's-in-the-East, in the Metropolis, Manchester, Cambridge, and St. Neots, which should effect a saving of half the present outlay, and improve the quality of the administrations in humanity and efficiency. In the most pauperised districts of the South, wages have been advanced by one-third, and by the improved labour, an equivalent advance was soon effected in the value of landed property. Another chapter would follow in a report by the chief local officer, whether of an Imperial or local police force, showing the state of crime and the means of its repression. In this it might be shown, as respects the rural districts, that the cost of the police service, by night as well as day, in checking fires, saving life, and various services on the occasion of calamities, does not exceed the cost of the unpaid parish constables. Next would follow a chapter by the chief engineer on the expenditure for the maintenance of the roads, bridges, and highways. As to the roads under scientific management, Sir John Burgoyne, referring to the roads in Ireland, stated to me that by an alteration, which would hardly be recognised by a common eye, a saving of one horse out of five would be effected, and this would obtain a saving of seven million pounds in the cost of transit. Another chapter would be on the cost of supplies of provisions and materials, which it is of the highest importance to have consolidated for the whole of a county under a competent intendance. There would be room also for a report on education, including physical training on the half-time principle, by which enormous economies and improvements in the manners, intelligence, and earnings of the future wage-classes might be effected. The whole course of local administration, based on the opinion of highly-qualified and competent paid officers, may be a means of the greatest public economy, whilst otherwise it may aggravate enormously the wastefulness of ignorance.

At the conclusion of this paper, Dr. Gray read the following table, in connection with it :—

BOROUGH OF HASTINGS, 1886-7.

CLASSES OF THE POPULATION.	Proportion per cent. of Total Deaths of each Class	Mean Age at Death.		PROPORTION of DEATHS from the under-mentioned CAUSES to 100 DEATHS from ALL CAUSES.					
		Of all who died—Men, Women, and Children.	Of all who died above 20 years of age.	Diseases of the Respiratory Organs, including Phthisis.	Principal Zymotic Diseases.			Diseases of the Nervous System.	Senectus.
					Enteric Fever.	Diarrhœa.	Other principal Zymotic Diseases		
All Classes—									
Males	49·23	38·2	55·9	31·06	0·68	3·81	5·59	10·35	3·68
Females	50·77		58·2	30·52	0·53	3·83	5·42	11·30	5·55
Children under 1 year .	19·32		—	17·78	—	13·54	10·07	11·46	—
Children under 5 years ..	29·44		—	22·78	—	11 62	16·63	10·71	—
Gentry, Professional Men, etc.—									
Males	43·18	59·4	63·9	24·56	0·88	—	—	7·89	7 02
Females	56·82		61·7	34·67	—	2·00	1·33	10·67	5·33
Children under 1 year ..	2·65		—	28·57	—	28·57	—	—	—
Children under 5 years .	3·41		—	33·33	—	22·22	—	11·11	—
Merchants, Commercial Clerks, etc.—									
Males	54·84	39·1	45·9	54·90	—	1·96	1·96	3·92	1·96
Females	45·16		54·4	40 48	—	4·76	2·38	14·29	2·38
Children under 1 year ..	9·68		—	11·11	—	33·33	11·11	11·11	—
Children under 5 years ..	18·28		—	29·41	—	17·65	11·76	5·88	—
Tradesmen, Shopkeepers, etc.—									
Males	50·23	34·6	54·4	32·21	0·61	3·99	7·36	11·35	2·45
Females	49·77		57·8	27·55	0·62	5·57	5·57	12·07	4·64
Children under 1 year ..	22·19		—	18·75	—	13·19	11·11	11 81	—
Children under 5 years ..	34·67		—	22·67	—	12·44	16·89	12·44	—
Wage Classes, Artisans, etc.—									
Males	48·93	30·5	52·4	28·16	0·97	5·83	5·83	10·19	2·91
Females	51·07		55·4	28·84	0 93	2·79	7·91	10·17	7·44
Children under 1 year ..	26·60		—	15·18	—	12·50	8·93	10·71	—
Children under 5 years ..	38·72		—	20·25	—	10·43	15.95	8·59	—
Fishermen, Boatmen, etc.—									
Males	57·81	36·4	63·8	24·32	—	5·41	10·81	18·92	10·81
Females	42·19		61·8	40·74	—	—	11·11	7·41	7·41
Children under 1 year ..	25·00		—	25·00	—	6·25	12·50	18·75	—
Children under 5 years ..	39·06		—	32·00	—	4·00	28·00	12·00	—

Enumerated Population { 1871—29,291.
1881—42,258.

Deaths in two years, 1886-7 { Males, 734.
Females, 757.
Persons 1,491.

Average Annual Mortality per 1,000 Estimated Population in the two years, 1886-7—14·3.

Estimated Population { 1886—51,224.
1887—53,137.

NOTE.—In the deaths are included those at the Workhouse (situated outside the Borough) of nmates formerly residents of Hastings, while deaths at the Sanatorium of patients who were no esidents of Hastings are excluded.

DISCUSSION.

Mr. Washington Lyon said that there was no doubt that the taking of the census on the present system—viz., every ten years—was very absurd. It struck him, however, that they would not get the Government to go from ten to one year all at once; they might have less difficulty in obtaining it, say, every three years. As a suggestion, he said that in some large towns it was nonsense to compare the death-rate with the population, and he instanced the City of London, where there were many people engaged in business during the whole or part of the day who spent the rest part of their time elsewhere. This rendered the statistics very misleading.

Dr. Drysdale, in commenting upon the paper, said their joint stock banks, and their Government, had a yearly budget, and why should there not also be a yearly census? One of the chief points which had struck him was the distinction which had been made between the death-rate of the rich and poor. The old plan had been a great mistake; what was really required was the statistics of the various classes separately. The death-rate was in some cases found to be twice as high amongst the poor people as it was amongst the rich. It would appear, according to Sir Edwin Chadwick, to be merely on account of lack of proper sanitation, but he had left out one very important factor, and that was lack of food. Sir Edwin Chadwick had also omitted to mention the birth-rate. In Kensington it was 20, whereas in St. George's-in-the-East it was nearly 40.

Dr. Greenhill asked how the calculation of the population had been made, and whether their plan was to be relied upon?

Sir Edwin stated that they were all made at the Registrar-General's Office.

Mr. Jas. Woonton (Sanitary Inspector St. George's-in-the-East) explained that the cause of the high death-rate in that district was the extreme poverty of the inhabitants. They had too little food and too much drink.

Dr. Bagshawe said that one element increasing the mortality of a town of the description of Hastings was that a large number of people literally came here to die. The number of convalescent homes, too, increased that tendency. He might also say that last year the death-rate was not 14 but 13.

Mr. Wilson Noble asked for the death-rate of visitors, as compared with residents.

Lord Fortescue owned that as the paper proceeded he had become more of a convert to Sir Edwin's views. At the same time, he would suggest that it would perhaps be better to take an elaborate census such as that proposed periodically, and a slighter one annually.

Dr. Gray supported the paper from the point of view of a legislator or politician. On the extension of the franchise, he felt sure they would have been given the power of sending two Members to Parliament if they had had an annual census, for then it might have been proved that they were above the required population for the retention of two Representatives. He also brought forward other similar instances.

Dr. Richardson said one of the great causes of mortality amongst poor children was that in illness they had to be huddled together in one room, thereby breathing a compound poisonous atmosphere. And in schools there was every chance of the spread of an epidemic. He strongly advocated the annual census, and the postal method of taking it.

Mr. Wilson Noble thought it was necessary that Parliament should be impressed with the urgent need of taking the census annually, and unless they could do this, he felt there was but little chance of its coming about. It was, therefore, almost necessary that the Government itself should take the matter in hand. He also thought the Post Office the best means of arriving at correct results. It might be said that the census was no business of the Post Office, but they must bear in mind that the office already concerned itself in other matters outside of its direct business; this was seen in that admirable institution, the Post Office Savings Bank.

Dr. Richardson proposed the following resolution:—"That this Congress holds that it is most important, in the interests of sanitation and for other objects, that an annual census of the population should be taken, and respectfully commends the subject to the favourable attention of Her Majesty's Government."

The resolution was seconded by Lord Fortescue, and carried, and Lord Fortescue and Mr. Wilson Noble undertook to bring it under the notice of Her Majesty's Government.

* * *

PRESIDENT'S OPENING ADDRESS.

DISCUSSION.

During the delivery of the President's Opening Address there were frequent manifestations of approval by the audience, and the President, on resuming his seat, received most enthusiastic cheers.

Mr. Wilson Noble, M.P., proposed a vote of thanks to Dr. Richardson. He could candidly say he was perfectly appalled in his endeavour to find words which in any way might express his appreciation of the address which they had just heard. But he rose with a great amount of pleasure and of pride that he should be allowed to propose this vote of thanks to him. He felt confident that the address was one which would not only, when it was read, benefit the town itself, but would benefit a very much larger area than was included in this borough. As they were favoured that evening with the presence of a distinguished sanitarian from France, he hoped he would be able to take back to his country some record of the address to which they had just listened. He felt sure that Dr. Richardson had to many of them addressed himself in a way which was somewhat novel to those who had previously studied the question of sanitation as a science regarding the health of the body alone, and he felt sure that the manner in which he had treated the subject would come as a revelation to a great many of them. He had shown them, that if they regarded sanitation of the body alone, they were not treating it in its highest aspect. If they regarded the sanitation of the body alone, they were doing nothing more than bringing the body into the condition of one of the brute animals, which were, for the most part, in a state of perfect sanitation. They must, if they were to be true sanitary reformers, do something more elevated than the sanitation of the body, and must turn their attention to the sanitation of the mind. We were inclined to regard sanitation as a subject which dealt for the most part with drain-pipes and subsoils, and he was confident that if the people of this town had the remotest idea of the intellectual treat which had been prepared for them that evening, the room would have been crowded to its utmost capacity. It was all very well for gentlemen like Dr. Richardson to come down and educate them in the way he had, but it remained with them whether they were to assimilate the good, nourishing, wholesome food which they had received, and whether they could bring forth the fruit which he had sown amongst them. It was no use their knowing a great deal about sanitary matters. They might have a vast amount of knowledge, and they might either keep it to themselves, or bring it to good account; and if the address of that evening was to have the fullest amount of benefit accruing to it, it would be for them in this town to take advantage of the lesson which Dr. Richardson had given them. He was a gentleman who had devoted his life to sanitary science, and he had, in consequence, gained a vast amount of experience, and therefore we in Hastings and St. Leonards must be doubly grateful to him for having placed that experience at our disposal. Not only had he done so, but he had devoted to the work of this Congress an infinite amount of energy, which he believed would make it a vast success. They had already seen what a success the Exhibition was, and he trusted and felt confident that the Congress itself would be a very lasting and permanent benefit to the borough at large. (Applause.)

Dr. Bagshawe briefly seconded, remarking that Dr. Richardson's address would long be remembered as one of the most useful and one of the most brilliant ever delivered from that platform. He was sure it would bring forth great fruit in the future, and that they would long look back upon the days when Dr. Richardson came amongst them, with gratitude. (Applause.)

The Mayor put the motion to the meeting, by which it was carried with loud acclamation.

Dr. Richardson, in return, could only say that he was grateful to them, which, however, very poorly expressed what he felt. He trusted that this Congress during its three days would be one of the most successful sanitary Congresses ever held. (Applause.) This was but the commencement, the real work would begin on the morrow. He was bound to say that the number of papers that had been given in warranted him in believing that sanitation would receive a most thorough and important discussion.

Dr. Pietra Santa briefly addressed the audience in French, expressing the pleasure it gave him to attend a Health Congress in England, where sanitation was so wisely and thoroughly studied, more so, indeed, than in other countries of the world. He congratulated the Congress upon enjoying the presence of Sir Edwin Chadwick and Dr. Richardson, whose names, he said, were by no means unknown as sanitary authorities in France.

SANITARY LEGISLATION.

DISCUSSION.

Earl Fortescue proposed a vote of thanks to Mr. Wilson Noble, the President of the Section. Mr. Noble had referred to the sanitary legislation of Moses. From very early times dysentery had been one of the scourges of mankind, and particularly with armies. Froissart and other historians of the knightly period spoke of it, and they heard of it in the religious wars, as they were called. He remembered reading of a siege in which the greater number of both besieged and besiegers died from it. Napoleon spoke of it as a scourge to armies, and the gigantic French and Allied armies suffered greatly. The English armies of late years had suffered less than other countries from it, because more attention had been paid to sanitation. He believed the specific cause of that terrible disease had only been discovered in their own times. The Jewish armies were exceptions to the rule. The Bible passage on that subject was striking: "For the Lord thy God walketh through the midst of thy camp; therefore shall thy camp be holy"—clearly identifying cleanliness with Godliness. (Applause.) Mr. Noble had rendered good service in showing how great was the evil which was implied in the quotation he made from Sir Lyon Playfair, as to the preventible deaths in England. (Applause.) That was due, to a great extent, not to a want of legislation, but to want of honest, zealous, and intelligent administration of the law. The carrying into effect of those principles rested with the Local Authorities, who were elected by the public, and though there was no necessary connection between poverty and ignorance, he could speak feelingly of the formidable obstruction which the ignorance of the poor had placed in the way of improvement. The question of labourers' cottages in the country was not so important as dwellings in the town. As a rule, agricultural overcrowding had almost entirely ceased, and the surplus population had migrated to the towns. The housing of the growing population in the towns was a serious problem. (Hear, hear.)

Sir E. Chadwick complimented Mr. Noble on his paper, but thought in the present condition of Parliament he would have little to do in the promotion of sanitary legislation. He congratulated Hastings on having a Member who could write so able a paper.

The Chairman said there were facts in Mr. Noble's paper of vast importance. He quoted his remarks as to the number of preventible deaths, and illnesses, and the loss of money thereby, and said those simple facts should be put everywhere where they could be read.

The motion was then put and carried.

LIGHTING IN RELATION TO HEALTH,

By Major-General WEBBER, C.B., R.E.

It is no new thing for mankind to be proud of the beauty and healthiness of the place where they may reside. Through all time, and in all countries, have been met instances of an intelligent appreciation of these advantages. Wherever men have congregated, there have always been some amongst them who have preached the ordinary common-sense doctrines of sanitation, in as enlightened a manner, and as practically, as we now pride ourselves on doing.

From Moses downwards, the existence of apostles of sanitation can be traced, either by what they have left in tradition, history, or by structural remains.

The older civilisations are full of signs of sanitary precautions, which, although insignificant they may be to us, are no less indicative of an appreciation of healthy arrangements contemporaneous with the instinct of self-preservation.

The distinctive expressions used in laudation of any locality included in the expressions, "good air," and "good water" still fall from the lips of people whose forefathers used them centuries ago.

The feeling of longing to get away from the haunts of men, which has inspired so many men and women in the past, was often an instinctive search for sanitary conditions of life; and may still be found with the South African Boer, to whom any aggregation of the race is abhorrent, who will "*trek*" away from a home at a moment's notice to find another, if he sees his own or other races settling down near him, to drink water above him on the same stream, or to stand between his nostrils and the breeze.

But we cannot "*trek*" when the water is suspected and the insanitary state of the drains is evident. We may have to spend our days in dwellings where the sun penetrates but for a few hours, if at all, and our hours of occupation and pleasure form such a large portion of the 24, that we cannot help having to live and move in the presence of other illuminants than nature supplies.

Fortunately for us, science endeavours to be equal to the occasion, and we have in every town, large or small, at any rate worthy champions, who are not only proud of the beauty of their locality, but also of its healthiness, and who make it their business to proclaim aloud its sanitary advantages and low death-rate on every possible occasion.

The very fact of the existence of such advocates is of material support to the municipal edicts of sanitation. They may not, perhaps, be able to appreciate how much they owe to the Science and Art workers, who have given a life of labour to the propaganda of the truths and laws on the subject; but they are sowing the seeds of an undying knowledge, the spread of which is, we hope, at last making real progress for the health and happiness of mankind.

But more than a knowledge of mere facts is desirable; and it is well worth the while of our friends to qualify themselves to spread practical information and instruction respecting the accessories of good sanitation, amongst those who have no easy means of obtaining it. I mean as to the nature and quality of the materials which should be used, and are, too frequently, not used, in dwelling construction, and in the appliances of daily use.

There is a whole world of useful teaching, which ought to be at the threshold of comprehension of sanitary conditions of life. For instance, it is not difficult to understand the importance of the existence of a transparent medium like glass in the construction of a dwelling; and, in explaining its importance and the difficulties in which we should be placed did it not exist.

A little more complicated, but still easily understood, when clearly explained, are the simple conditions which surround the use of, and selection of, our means of artificial light. Although it may be difficult to teach the power to analyse the claims of all the different systems and their myriad subordinate inventions, it is not impossible to initiate the most simple into the elementary advantages and dangers of each of them.

If in any way we can enlighten ignorant minds, and give order where light has hitherto been as darkness, to no matter how small a degree, the work of such Congresses as this will not be useless.

I do not suppose that any of us who have the power of performing our daily work under conditions in which we have the intelligence to be able to reflect, have not over and over again realised the sense of physical enjoyment imparted by light; and especially by the redundant diffusion of sun-light reflected from and illuminating the form and colour of our surroundings; whether they be those which our eye familiarly rests on in our own sanctums, or those which present themselves as we take our way along the sunny side of the street, by the level sea beach, or through the country lanes of our neighbourhood.

To us who can sometimes in winter go south in search of sunshine, is permitted the duty of considering the circumstances of the great mass of the population, who, even in the country, see the sun at noon in midwinter barely 19 degrees above the horizon, and who in towns rarely see him at all.

If for no other reason, the importance of the action of light in the process of the early development of the individual, is a question too interesting to the future existence of the race not to absorb some attention.

As the greater number of hours of the day are passed in the reflected light of the sun, I propose to myself to say a few words in the first instance respecting its influence.

Sir Edwin Chadwick, in reporting on the Paris Universal Exhibition of 1867, referred to the "Cottage Window Question" from the point of view of the sanitary importance of admitting as much sunlight as possible into dwelling-rooms.

The objection often raised against large window openings, on account of the large surface of glass, which radiates heat, he meets by the substitution of thick glass or of double thin glass for the very thin glass generally used. He brings the cost of sunlight through thin glass home to us by assessing its value in the waste of heat. One-third of that given out by the coal consumed in an open grate, he believes, is lost through the glass, and a saving of this waste would compensate many times for the increased cost of the thick or double glass.

It is to be feared that architectural rules will never submit to the external disfigurement, which would be caused by the glass of windows being as nearly flush with the external surface of walls as possible. Nevertheless, the gain in admission of light would be considerable if it was adopted. In the days of the window tax it might have passed muster.

Early in this century Edwards gave much attention to the effect of light in natural development. He studied it from the point of view that health is impaired by living in the dark. One difficulty he encountered was that of separating the effects of it from those due to other disturbing causes. This would be especially the case in observation of the human species, the more so the more artificial the manner of living. Humboldt observed the physique of native races he met in South America, who lived in a very primitive way, but with healthy surroundings. He attributed the fine development of the adult and the infrequency of deformity to the constant exposure of the body to bright sunshine.

Edwards turned his attention to the examination of the influence of sunlight on the proper development of animals. The development which takes place in the changes of form they undergo, in the interval between fecundation and the adult age, received his special notice.

Observation of those changes which take place in the dark and out of sight previous to the stage we call birth could not be made; but in those, like the frog, in which the development can be seen, he had great room for investigation.

He naturally selected animal life which gave such opportunities; and he also tried to find out the influence of light alone, eliminating, as far as possible, the effects of heat.

He placed frog spawn under water in two vessels; one he exposed to the sunlight, the other he left in the dark, both were in the same temperature. The difference of development in each case was wide. It was observed that in the sunlight the eggs developed in due succession, but that those developed in the dark were largely a failure, and that those which germinated showed remarkable transformations.

He next tested the effects of light on the process of development in the bodies of these animals after incubation and during growth. He continued to experiment with the spawn of frogs, on account of the marked differences which exist between the various stages of their growth. For instance, in the first period, these little creatures, commonly known as tadpoles, are possessed of a form and development, and have a mode of life resembling that of fishes, without limbs, but having a tail and gills. In the second period they become reptiles, and lose all external resemblance to fishes. They become possessed of four limbs, and lose their tails and gills.

It was found that when the tadpole was placed in the dark its development into a reptile was not absolutely prevented, but greatly retarded in comparison with the rate of progress made by his brother in the full light of day.

A second experiment was made with other tadpoles of the same spawn, some of which were placed in two vessels of water exposed to the light, but, in one case a diaphragm rested on the surface of the water, so that the little creatures could get no air; in the other they had full access to the surface for purposes of respiration. The difference in the rate of development in the two cases was but slight. From these results, Edwards argued that the most important exciter of healthy development in the spawn of a frog is light.

This experiment he repeated several times, always with the same result, namely, that the tadpole developed completely in the light, those in the dark invariably developed partially or very slowly.

He also observed that in the case of those placed in the dark, there were no signs of deterioration or decay, the normal increase of weight was attained, and no other differences resulted except delayed or prevented development.

Repeated results went also to prove, that the influence of light tended to a development of the different parts of the body in their just proportion, and that a deficiency of light tended to produce deformity.

Again, he found that the effects on subjects of experiment, of the presence or absence of light during growth were more marked the earlier they took place in their lives. The older the subject, the less the effects.

Edwards observed that one species of eel to be found in the subterranean waters of Carniola, where daylight never penetrates, and where the temperature is low, never completely developed into the adult form which is reached by the same animal living under normal conditions of light.

Other observers have frequently remarked that deformities and scrofula are most frequently met with amongst the young who are resident in dark streets and dwellings.

It has been more than once suggested, that growth under the influence of sunlight is favoured as much by the extraordinary sensibility and hence receptiveness of the eye to light, as by the exposure of the surface of the body to its rays, and that the eye may act as a collector and transmitter of its health-inspiring influence to all parts of the animal system.

Early in the century, simple effects of light on vegetable life were observed and recorded by Mr. R. Boyle. With reference to flowers, he refers to those which, obedient to the influence of light, follow the sun in his diurnal path, so as to look him straight in the face. This instinct of self-preservation can be seen in the case of a plant in a darkened room, light being admitted only through a small hole; the flower will turn towards the hole, and if placed near it will allow itself to become distorted, in its efforts to get through the hole, in order to enjoy the full blaze of sunlight.

Many of us have seen the action of the leaves of a geranium placed in a window, how the leaves will all turn one surface to meet the light, and in such a way as to receive its full benefit. Take this same geranium and remove it to an opposite window, and contortion and confusion of the leaves will set in and continue until they all again turn the same surface as before to the health-giving influence.

That it is light which they seek is proved by the result of placing a geranium in front of a warm fire, which has a window opposite it. The leaves will turn away from the warmth of the fire towards the light.

Dr. Hill many years ago made some interesting experiments in the same direction. He employed as his subject an "abrus," or scarlet bean plant, which he brought into a room into which the direct rays of the sun did not enter during the afternoon. The effect was that the lobes of the leaves fell and closed at their under sides. They continued in the same state all night. In the morning, half-an-hour after daybreak, they began to separate, and at a quarter of an hour after sunrise they were perfectly expanded. Again, towards the afternoon they settled down. By placing the same plant in artificial darkness, and again and again exposing at intervals to light, he obtained similar behaviour as a result, and he was led on by this to speak of the "*sleep of plants.*"

Before the year 1880, many scientists had noticed the effect of artificial light on plants; but it remained for the late Sir William Siemens to utilize the large means at his disposal, and shew in practice the real extent and value of what had, previous to his time, been little more than suggestions.

The well-known effect of the Electric Arc on persons using it, in tanning and even blistering the skin, first led him to believe that the action was analogous to that of the sun, and hence probably equally analogous in producing the colouring matter of plants. His experiments went further to ascertain whether electric light also affected their growth and development.

It may be re-called by some present that his first trial was an experiment on seedling melons, cucumbers, and other vegetables while still in their seed pans, under the influence, firstly of the sunlight, secondly of the electric light at the same angle, and thirdly of both together.

This, we are told, was not a fair test of the best results that might have been obtained from the electric light; but it showed clearly that all the effects of the sunlight were also produced by the electric light, in the proportion of about one-half. "Those plants exposed to both sources of light evinced a decided superiority in vigour over the rest, and the colour of the leaf was dark rich green." The gardener in charge stated that without the assistance of the electric light to the sunlight, he could not have brought on his cucumbers and melon plants during the early winter.

Another of his experiments was with young vegetable plants, about 20 to 40 centimeters high, the electric lamp being placed in the same building, and at a distance from the plants ranging between 1·5 and 2·3 meters. The same division of the use of the light was employed as before, and the experiment lasted for four consecutive days and nights.

"The plants that had only been exposed to daylight (with a fair proportion of sunlight) presented the usual healthy green appearance; those exposed to electric light alone were of a somewhat lighter hue than those exposed to daylight; while the plants that had the benefit of both day and electric light, far surpassed the others in darkness of green and general vigour."

An experiment made with pots of early strawberries showed very marked results. The plants were partly setting fruit and partly in bloom. Some were exposed to daylight supplemented by electric light, which latter was also continued through the night, others were subjected to the ordinary conditions of daylight.

"After a week the fruit on the plants exposed to electric light had swelled very much more than that on the others, some of the berries showing signs of ripening. The experiment was interrupted for two nights at this stage, but when the electric light was resumed, very rapid progress was observable." After four days' further exposure continuously to both day and electric light, the berries were almost ripe and well coloured, while those that had been exposed to daylight only were still small and green."

Sir William Siemens' experiments during the winters of 1880 and 1881 led him to several very interesting conclusions.

That an electric arc nominally equal to 1,400 candles, placed at a distance of two meters from a growing plant, appears to be equal in effect to average daylight in February.

In spite of Darwin's opinion in favour of the view that many plants, if not all, require diurnal rest for their normal development, he concluded "that plants do not appear to require a period of rest during the 24 hours of the day, but make increased and vigorous progress if subjected during daytime to sunlight, and during the night to electric light."

Those who have travelled in countries where it has been necessary to expose themselves to the sun, have had varied and contradictory experiences, and have seen and felt effects from its direct rays not unlike those described by Sir William Siemens as follows, when he exposed plants, first to the direct effects of a naked arc light, and second, with glass interposed. "The portion of a plant under the direct influence of the naked light, though at a distance from it of 9 to 10 feet, was distinctly shrivelled; whereas that portion under cover of the clear glass continued to show a healthy appearance, and this line of demarcation was distinctly visible on individual leaves."

This led him to make the suggestion that it was the highly refrangible rays beyond the visible spectrum, and not the luminous rays, which were the cause of the destructive effect; and that, on the contrary, the luminous rays stimulated organic action.

I have always found that the body in health can gradually accommodate itself to the direct rays of the most tropical sun, and it is extraordinary what men accustomed to their action can stand in that way.

Before the first Afghan War, many of the European troops in India wore the same head-dress as their comrades at home, and during the Mutiny, I remember meeting several old East India Company's officers who wore their gold lace forage caps at noon under the burning sun of an Indian June, and who laughed at the care we took to protect our heads.

It is very doubtful if the expression "sunstroke" is not quite misleading in describing the results of what is known also as "heat apoplexy." I have seen cases of persons falling as if they had been shot, both when the light was obscured by a dust storm, as well as at night.

Those who have been exposed to a nearly vertical sun, either at high altitudes, or in the clear air of the African desert before the sand has become thoroughly heated, know what it is to feel no serious inconvenience, even though everything, including their own clothes, within reach of their touch almost scorched the fingers; and as long as the air remained comparatively cool, a sensation of pleasure has been experienced by those who have innured themselves to the action of direct solar rays.

The sensation of relief when shade is reached is far more due to the lessening of temperature, and relief to the eye from glare, than to the removal of the action of light on the body.

When Sir W. Siemens tried the effect of different coloured glasses, he found that a less vigorous growth in the plants was induced when a yellow glass was placed between them and the source of light, the inferiority in colour and thickness of stem was marked; red glass gave rise to lanky growth, and a yellowish leaf; while blue glass gave still more lanky growth, and a sickly leaf.

That the rate of growth and the length of intervals of repose conducive to vigorous or early development adapt themselves to the conditions under which light is given, may be allowed an example in the earlier development of the human physique, in countries where more sunlight is enjoyed. The final result in various latitudes may be the same, all other conditions being alike, but the time in which that result is reached varies to a marked degree.

Apart from the influence of temperature in the growth and development of plants, it is clear that the life as it exists under the alternating influence of solar light and darkness, must vary in condition, between the case when those alternations are daily, as in low latitudes, and the case when they hardly exist during the summer season at high latitudes.

It is well known that the rapid growth and ripening of the crops at high latitudes is favoured by the assistance in light given during the bright moonlight nights of harvest-time; and visitors to the northernmost parts of these islands will always hear the farmer hope for a bright moon, as well as for sunlight, to secure a good ingathering, regarding its ripening effect as of no little importance.

I will now return to the subject of artificial light.

The wants of man in great cities have become so numerous, that the question of their distribution has become one to which the Sanitary Engineer must give some attention.

Although he may believe his mission to be confined to the prevention of the actual causes of disease, if he desires to study all that contributes to life, or living, he should study the engineering of all those demands which affect the daily life of the public. It is a narrow view of his duties to limit his work to that of an Inspector of, what are ordinarily called, "nuisances." My conception of the range of his inspection is, that he should, to a certain extent, regard everything in connection with supply, whether of heat, light, power, or ventilation, as coming under his ken.

I do not mean that he can be an expert in all these things; but he ought to be able to form an opinion on the questions appertaining to public safety, no matter what the nature of the supply or demand may be.

We now find that not only water and gas, but steam, electricity, and hydraulic power are being supplied to dwelling-houses and places of business from generating or storage centres, and that, although the legislation granting powers to supply such things is often carefully laid down and described, still, owing to the want of knowledge of first principles sometimes encountered amongst Municipal Officers, the control which it is only right should be exercised is absent, and all sorts of abuses are rendered liable to arise. Although the local Surveyor may be an expert in making roadways, and in sewage questions, he is not expected to have any acquaintance with the soundest conditions under which supply should be conducted. He need know very little of what is going on under the roads, though he knows all about their surface maintenance.

For instance, it is well known that in the case of distribution of gas, the leakage from the pipes in early years amounted to as much as one-fourth of the whole amount produced. The gas thus wasted escaped into the surrounding soil, saturated it, and created in it insanitary conditions which were often the cause of mischief.

However, I believe I am right in saying that such a possible nuisance was not contemplated in the original Gas Acts; and even if the Local Authorities had been advised by their Engineer of the existence of such a state of things, they had no power to interfere. I have frequently been present, when, during the excavation of ground in the neighbourhood of old gas mains, the odour from, and appearance of, the soil has closely resembled that which would be produced by the presence of sewage.

On the other hand, I have known cases in which the Local Authorities, perhaps acting under the advice of their expert officers, have regarded the influx of systems for the distribution of all sorts of services as a matter simply of profit and relief of the rates; and have had no desire to obtain any statutory authority over the working of such systems so far as the taking up of the streets, and the manner of execution of the work are concerned, in the sanitary interests of the ratepayers.

The more such systems exist in a town, the more the surface of the roadways is liable to disturbance, not only in order to repair the conduits of each system, but also in order to repair the damage caused by the working of the one or the other. For instance, it is well known that in American towns there is frequent interference by the escape from the steam conduits with the insulation of the electric light mains.

As improved means for the construction of the surface of the streets are on the increase, such as by asphalte and wood paving, so the inconvenience of such disturbances to the inhabitants and the cost to the undertakers is increased. A roadway undergoing constant alteration and repair may be profitable to the Municipal road contractor, but not healthy to those living by its side, to say nothing of the inconveniences and risks of accident.

Subways are the best means of relief, but they are costly; and foresight on the part of Local Authorities able to borrow to carry out Municipal improvements, will for a long time be likely to devote the capital raised under these powers to more pressing works.

At the same time it can easily be shewn that if the first systems of water or gas supply, and the sewage in many streets, had been once for all laid in a subway, the actual economy in maintenance and repairs and saving of waste, would have long ago paid a high rate of interest on the outlay.

London, of course, presents very exceptional conditions, but I will cite an extreme case which came under my knowledge in Cheapside. When, 19 years ago, I was engaged in laying down Postal Telegraph lines under that thoroughfare, it was then suggested to the Commissioners of Sewers to carry the Holborn Viaduct Subway eastward if only as far as the Royal Exchange, and it was clearly shewn to them the enormous advantage that would arise from the presence of such a tunnel for the necessary services of the houses, and absence ever after of disturbance of one of the most crowded thoroughfares in the world. The calculations presented, if I remember rightly, showed a most attractive return, by moderate rentals to be charged for way-leaves. But the opportunity was lost, not likely to return, unless the scheme of a subway railway, now before Parliament, finds favour.

At first sight, the importance of this, from a sanitary point of view, may not be so apparent; but I would like to remind my hearers that the weakest points in all systems of house-to-house supply, no matter what may be its nature, lie at the junctions between the mains and the house services, and that accessible conduits or subways will alone allow these to be easily come-at-able for repairs. The want of such facilities means often protracted and undiscovered leakage, which may be detrimental to health in dwellings, and even dangerous to life.

The gist of all this is that we find the responsibilities of the engineers of towns to be largely increased and daily increasing, and that a knowledge of sanitation on their part is as intimately necessary as a knowledge of engineering construction. Every work which comes under their supervision or ken has its sanitary aspect, and they cannot delegate the consideration of that aspect to others. With sanitation I venture to include public safety.

It may be due to the fact that the Local Government Board and the Board of Trade administer indiscriminately much that more properly should come under one Government department, that local sense of responsibility has been diminished, but I shall not occupy your time now with the legislative aspect of the case more than to point to the fact as the possible cause of supineness here and there.

There is one kind of supply in towns the practical and sanitary aspects of which have occupied my attention for very many years. I refer to that of illuminants, or artificial means of lighting.

Amongst the wonderful advances of the century, by which the resources of nature have by science been brought into the service of man, there is none more interesting in its results than that connected with the distribution of means of lighting in towns. We are so accustomed to it, that alongside of other and greater wonders we are apt to forget how much of the comfort of daily life we owe to illuminants.

I am not at the moment thinking of domestic lighting so much as the facility that now exists of illuminating places in which the various industries are carried on, and of the degree that this facility reflects on the powers of production and on the health and successful handiwork of the operatives engaged.

Although nothing can equal the perfect comfort of working in the broad light of day, still we have a right to claim, that, if the best artificial light is widely deficient in comparison with sunlight, many hours of good work in production have been added to the time of output, by which the working hours of a nation, and consequent results in wealth, are increased to no small extent.

But it is needless to remind my hearers that there are very many hours in the year when artificial light must be resorted to, especially within buildings situated, as in many narrow thoroughfares in towns, where daylight is barely accessible even on a sunny day.

The history of the growth of the distribution of lighting gas is one which could not even be epitomised within the limits of this address.

It would be an interesting subject, indeed, if anyone could compile the statistics of the resultant benefits which this industry has conferred on mankind, especially those which would bring out the value of the labour saved in economical productions, the increased employment given, and the actual rise of total wages earned by the individual—all more or less due to the existence of a cheap and efficient illuminant.

While experience in the distribution of water had been in progress of collection, even so long ago as in the time of the Roman Empire, none in connection with the distribution of gases had been gained before this century.

As has been already stated, the early work of laying down pipes for the purpose of conveying gas to consumers was often extremely defective, and long after this was well known, financial considerations prevented the only effectual remedy being applied, namely, the renewal of the mains.

But in spite of this, the industry made its way, and in time it has become as much a matter of course for a gas main to be laid down in a new street, as for a supply of water.

In its early days, gas lighting had to compete with lamps and candles only; the application of its great rival, *mineral oil*, was not understood, and although, like other innovations, it had to overcome a large amount of prejudice, it did not encounter the rivalry of existing fairly efficient means. The benefits and advantages it conferred at that time were immeasurably in advance of any other means of lighting then existent.

With many of the objections to its use, as valid and well-known then as now, it had so many predominant advantages that the demand for it soon overtook the supply. Under the circumstances, a kind of monopoly has sprung up, for want of far-reaching legislation when the early Gas Acts were passed.

Although a monopoly was created in some instances, it must not be supposed that the public has suffered everywhere. Take, for instance, the gas supply in the City of London, where, owing to short hours, the conditions of time of consumption are such as to be a less attractive investment to the suppliers than in others.

Originally there were three companies. Previous to 1823 these companies skirmished about and laid down their pipes wherever they could; probably no one believed in it, and the Commissioners of Sewers of those days paid little attention. In 1823, however, the three companies had separate districts allotted to them within the City. No doubt the whole thing was regarded as an experiment, but sufficiently hopeful to justify some control being exercised, and competition in digging up the same streets being prevented.

This state of things remained in force till 1848, but in spite of the absence of direct competition, the price of gas in the City of London fell from 15s. to 6s. the thousand cubic feet. Since 1848 there has been a gradual process of amalgamation going on between the supplying companies, still the price of gas has steadily fallen, until it now stands at about 2s. 9d.

The outcry against so-called monopoly has proved to be unreasoning. If competition in the same street and to supply the same house had been encouraged by local authorities in those early days, nothing but defective service, bad work, and loss of capital producing speculation would have arisen, and gas supply would have not been in the position it now holds, and the enormous benefits its use has conferred on the community would have been lessened.

The check on excessive profits established by Parliament, by which, after certain remuneration has been reaped by the shareholders, the consumers also share in the profits by a reduction in price, works in a satisfactory way.

If Parliament had also regulated the questions of quality and purity as thoroughly as, for instance, has been done by the Municipality of Paris, in their regulations of 1850 (I think), nothing would have been left to be desired.

While it has been our national good fortune to be the experimenting ground for such an industry as that of gas supply, that advantage has not been without some drawbacks. The same kind of thing has occurred on the other side of the Atlantic. The rush to apply the telephone exchange system disfigured half the towns of the Union with poles and wires.

The history of the results of imperfect and experimental work in the early days of gas supply in this country would probably shew the source whence the regulations compiled by all the other Authorities in Europe were drawn. For instance, the precautions against the chances of leakage, especially within doors. I know that this branch of the subject received careful consideration from the Municipal Engineers and advisers when gas supply was first proposed in France. The rate of normal escape of gas indoors can be minimised, but there is no doubt that there have been in the past, and in spite of all improvements, there are still, thousands of instances in which it has been either permanently or intermittently abnormal.

In regard to comparison with its great rival illuminant, namely, mineral oil, this consideration of leakage, when not in use, of coal gas into the atmosphere of dwellings and workshops, is of very great importance. The question of creation of products of combustion when in use is common to both.

Considering the combustible nature of hydro-carbon illuminants, the statistics would probably shew a marvellous degree of immunity from accident and fire.

The very exceptions prove the rule. Some will recall the extraordinary appearance of a group of streets in the Bloomsbury District of London, in the winter of 1878-9 (I think) after an explosion had occurred in the mains. They looked as if a huge steam plough had torn up the roads, leaving a yawning trench throughout their lengths of many hundred yards. Fortunately for the Gas Company, no lives were lost, and hardly anyone injured. The streets were not important thoroughfares. Had it occurred in the West End, the outcry might have been difficult to allay.

From the sanitary point of view, the use of gas assumes a special position, and requires careful handling.

The Gas Companies produce, distribute, and sell, what has long been considered an indispensable article.

They generally do so under given conditions of pressure, purity, and illuminating power or quality.

They are not in any way responsible for the use to which it may be put by their customers. If all the fittings and pipes in a house are leaky, if all the burners allow more gas to escape unconsumed than they burn, the suppliers need not even be aware of it. On the other hand, the larger the quantity which registers in the customer's meter, the better for them.

To counteract this possible injury to health, which no doubt is of a very insidious kind, we find certain opposing forces: first, the amount of the quarterly gas-bill; second, the spread of public demand for all those useful little inventions for regulating the supply and consumption of gas, whether for light or heat; and lastly, the good sense from a commercial point of view of many Gas Companies in spreading information amongst their clients as to the best and most economical way of consuming the largest quantity.

It is, I submit, quite clear that we have arrived, as regards our gas supply and consumption, at a position the most favourable for all parties concerned. The Companies are firmly established; their aggregate capital is enormous. The industry has eventuated in being a very lucrative investment for those who started it. All the engineering and commercial conditions of supply and demand are thoroughly well understood, and most of the advantages, disadvantages, and precautions, inherent to the use of gas as an illuminant, are matters of every-day common sense amongst, at any rate, the educated classes.

Looming in the distance, and growing gradually nearer during the last seven or eight years, is an important rival, and one which science teaches us must eventually supersede all other means of conveying energy, whether for lighting or for power.

When I say *must*, I wish to confine myself to its theoretical sense. Meantime and while this truth is asserting itself, capital will be expended in all sorts of schemes for distributing these necessities of man in other ways; nay, it will be expended vigorously in thwarting the success of undertakings connected with the application of electricity as an agent.

Confining ourselves to the sanitary aspect of the question, we may fairly admit that the rivalry of electricity with gas as an illuminant is one of a very important character in the interests of health, and that it is past controversy that most important advantages to health and length of life will accrue to the population which lives and works under its illumination during the hours that sunlight is not available.

Moreover, it may fairly be inferred that the growth and development of the rising generation of the country will be benefited by the universal adoption of this means in quite as great a proportion as it is now deteriorated by the more or less improper use of gas.

So-called "panics" in gas shares occurred at the time of the Paris Electrical Exhibition of 1881, in consequence of the public imbibing some such views as I have expressed above. Let us at once dismiss all alarm under this head.

One thing is certain, and that is, if half what I attempt to describe is borne out by facts, nothing will prevent the gradual introduction and universal adoption of electricity as a means of lighting. So that gas undertakers will be wise to accept the inevitable and even take up the position of public benefactors, and in their own clear interests join on to their present business that of the manufacture and supply of electricity.

They have, besides, however, a great development of their present industry at their feet, the profits of which to them will far exceed anything they have made by lighting gas. I mean by the distribution of cheap heating gas, by the use of which alone is the key to the solution of the great question of smoke abatement.

As to the engineering aspect of this latter question, one might be tempted to enlarge indefinitely. I must desist, and hasten to recover the path in which I started and design to continue.

Hitherto it has been the habit of many to reiterate that electricity is still in its infancy, and not well enough understood for commercial distribution. It is true we cannot touch, or smell, or see it, and perhaps that has something to do with its rejection.

I was startled the other day to receive a letter from a friend in South Africa, a contemporary in the study of electricity, in which he informed me that he had just formed a company for lighting by gas the town of Johannisberg in the Transvaal. He alluded to a former suggestion of mine—that in a new country like that electricity was, as a matter of course, the proper illuminating agent—as a visionary and speculative proposal, only to be realised in years to come. He took no account that the transport of the electrical plant from home to do the same work must cost half that of the gas plant, or of the advantage of starting electric light without competition in a country where the question of heat from lamps is of much importance.

Now Johannisberg is a town that has sprung into existence, including 20,000 inhabitants, in two or three years, and they expect to charge 10s. a thousand for the gas. They could make a good profit out of electric lighting, if they charged half that rate, light for light.

Is it true that my friend is right, and that electric lighting is still in its infancy? I think not, and that Johannisberg will suffer for the procedure of its Local Authorities. I am told that the Boer Government will grant a concession of 50 years for gas lighting, but none for electric lighting.

All I can point to is, that in spite of cheap gas in competition, Electric Lighting Provisional Orders and

Licences have been applied for in areas extending over a very large portion of the Metropolis, and are also contemplated in many other towns in the kingdom.

I believe it may safely be asserted that a vastly larger amount of scientific and practical information on the subject is at this time in the possession of electric lighting engineers, than existed as regards gas supply at a time when considerable capital sums were being already invested in that industry.

At the same time, the very wide criticism which is being bestowed on the systems of distribution of electricity which are proposed, may well inspire with doubts the would-be consumers and possible investors.

If I am right in claiming for this means of artificial light a high place from a sanitary point of view, I trust I may be allowed to try and interest my hearers, before I conclude my remarks, in the differences between the systems now under the consideration of the Government.

Broadly speaking, they may be classed under two heads, namely,—

1.—The system which employs alternating electric currents, and supplies the energy direct from off machinery in motion.

2.—The system which uses continuous currents, and accumulates or stores the electricity as essential to the process of supply, so that the consumer is independent of the machinery in motion.

I would prelude my remarks by stating that both systems are efficient, both have their inherent advantages and defects, and that the line of demarcation between the fields of application of each is very distinctly defined.

The alternating system makes use of the very beautiful laws of electrical inductive effect, the application of which was foreshadowed by Ruhmhoff, Jablokhoff, Marcel Depretz, and others, combined with the application of the well-known law that the greater the pressure, the smaller the conductor for the same quantity.

Its advantages, generally speaking, are that current can be conveyed long distances at high pressure in small conductors, and when it reaches the point of consumption, so much of it as is required can be transformed into a supply at a low pressure convenient for safe use in electric lamps. This permits of the generating place or station being at a long distance from the consumption, and other conveniences, which are of importance, but, as up to now the alternating current cannot be accumulated or stored up, it follows that as the incandescence of the consumer's glow lamps is directly produced from machinery in motion, the cessation, entire or partial, of its revolution must leave the user in darkness.

With all possible precautions as yet suggested, it is not certain that this possibility is completely avoided. It is much like the arrangements of the very early Gas Companies, which delivered the gas direct from the retorts without the intervention of a gas-holder.

There are other important questions connected with danger to life from the possible leakage of the high pressure currents, which are inseparable from the system, upon which I need not dwell now.

All are pretty much agreed that this system is best applicable to districts in which the consumption is scattered, where individuals or groups of them desire to have the luxury of this means of lighting, at a long distance from sources of supply, and surrounded by dwellings in which the residents are not likely to be able to afford to use electricity until its cost has been very much reduced.

It is not that the principle of this system is altered in such cases, but that it is about the only way, subject to the drawback referred to, of carrying electricity economically into some districts. It is evident that the generating plant to be installed must be equal for the supply of the maximum demand.

The second plan is one which is combined with storage of electricity. It follows the lines of working of the Gas Companies, namely, to keep making and storing gas, during all the hours when consumption is trifling. Hence the generating plant need not be by any means of the magnitude necessary to meet the maximum demand.

This rate of demand is an interesting feature of the question, and is described by Mr. Crompton in the following way:—

Expressing it by a curve, he says that: On the average day in the year, the curve runs upwards with increasing steepness from 3 p.m. to 7 p.m.; at 7.30 the apex of the mountain having been reached, it begins to descend to a point about 60 per cent. of the maximum, from which there is a very gradual decline between 8 and 10 p.m. Thence it again descends until 1 a.m. when zero is nearly reached, to be left again at 6 a.m., when the use of light re-commences, and from that hour until 3 p.m. the line is nearly level. The average during 21 hours out of the 24 is really only 4 per cent. of the maximum.

The plan of this system is to establish stations containing accumulators at convenient positions, whence supply can be distributed within, say, an area comprised in a square of 400 yards side.

These storage stations are charged from a generating station, which may be situated at any convenient point, even at a considerable distance. From these storage stations current is distributed in a net-work of mains at a low and uniform pressure.

The customers for current run no risk of either danger to life, or of a stoppage of light by the breakdown of machinery.

The charging of each half of such a storage station goes on alternately, say for 16 hours out of the 24; during the remaining 8 hours the machinery is at rest, and the whole storage station is discharging current to meet the maximum demand during lighting hours.

At present accumulators are made so as to permit of occasional abnormal rates of discharge so as to meet the conditions of a foggy day.

In such a system, as the demand on the storage station within its surrounding area increases, the dis charge from the accumulators can be supplemented by special running machinery, but in such case an accident to such supplementary source of supply would not put out the light.

Various arrangements, all combined with accumulators more or less similar to the one described, have been suggested, and some are in use.

It is evident that this second principle is best adapted to districts in which houses are frequent. For instance, taking an ordinary residential area of the best part of London, a square of 400 yards side will contain about 200 residences. If one-third of these houses require the electric light, which is a liberal estimate of the probable demand for some time to come, and each house requires to light an average of 27 glow lamps at a time, a storage station for 2,000 lamps will be required at first for such an area.

A practical way of giving my audience an idea of what may be possible in this direction is to give the approximate cost.

The cost of the storage station and the mains within one of the areas described would be about £6,000. The share of a building and generating plant, supposing twelve such areas had to be supplied, will be about £2,500 more.

For twelve areas, the total cost would then be about £102,000, or about £150,000 to the square mile, covering all contingencies.

To supply every house in the same area would not require such a very large increase of capital expenditure. By the means already pointed out, the generating power can be increased 50 per cent. by the expenditure of about £600 per storage area. By reverting to the Hopkinson three-wire system, an expenditure of less than £200 more per area will provide for increased capacity of distribution in the copper mains; and by doubling the accumulation the further demand will be complied with. These figures will exact the further expenditure of £4,800 per area and £2,500 per generating unit, or a total of £7,300 per area, or £158,000 per square mile.

In other words all the houses in an average district of one square mile can be supplied with the electric light on the storage system by an expenditure on plant of £308,000.

This plant will sustain 101,000 glow lamps of 10-candle power alight at one time. It is generally estimated that the number of lamps in actual use means that twice that number are installed. In other words, that if a house uses a maximum of 27 such lamps at once, there will be 54 fixed throughout the house.

If we suppose that each of the 101,000 lamps in the district sketched out earns 18s. per annum for the suppliers, we get a gross revenue from such a system of nearly £91,000 per annum; pursuing this further, and estimating a nett revenue from this of one-half, we get one of £45,500, on a capital expenditure of £308,000.

This means interest at the rate of 15 per cent. Each 10-candle power electric lamp costs the consumer about one farthing per hour at the rate of earning given above, namely 18 shillings a year for 864 hours per annum. Here I think we have a margin which will, still giving the investor ten per cent., bring the cost of the electric light, some day not far distant, nearly down to the cost of gas.

I pray it may be remembered that the figures given above are intentionally not nearly so favourable to the profits of an Electric Light Supply undertaking as those usually propounded. My object has been to show roughly that the universal use of the electric light in the future is no longer a matter of mere speculative estimate. Time does not permit my offering you similar figures as regards the alternating system, the application of which I can only recommend, as I have said, to sparsely populated districts.

I fear that my subject is so fruitful that it has led me to trespass too far on your patience. Our mission is to throw light on sanitary questions, and so long as "the sun and the light be not darkened," to promote the knowledge of a subject which in each and all of its branches is so necessary to human happiness.

DISCUSSION.

Dr. Richardson congratulated General Webber and the Congress on the paper which had been read.

Professor Ayrton proposed a vote of thanks to the reader of the paper. Warming and ventilation should be as distinct as lighting and ventilation. Warming, lighting, and ventilation, were quite distinct, and ought to be carried out by three distinct agencies. Ventilation should go on quietly without any action on the part of the occupants of the room. The best ventilated places, he thought, were coal mines and underground theatres, of which the Criterion in London was an excellent example. A fireplace for a sick room was inconvenient and troublesome, and as a substitute, he suggested that for ventilation an electric current should be used. Electricity could not be economically used for heating buildings. They could use gas, and by that means they would relieve the towns of the fall of smoke which too often hung over them. It was very nice to have the big dividends of the Hastings Omnibus Company. He wished he had some. But it was not very nice for the horses to pull the heavy 'buses up to Silverhill; much of the labour was lost by friction, and there was a loss, and though there was labour in drawing the 'busses up, brakes had to be put on as a check coming down. Machinery would not tolerate such a waste of power. The vehicles coming down should help those going up. That was done with the electric cars.

Professor Hughes seconded the motion. He thought the relation of electricity to health had been very ably brought forward.

The vote of thanks was carried, and Major-General Webber took the chair.

ON THE MORTALITY & PUBLIC HEALTH OF HASTINGS.

By W. A. GREENHILL, M.D., Oxon.

ABOUT five and thirty years ago I wrote two articles "On the Average Mortality and Public Health of the Hastings District," which our excellent President, Dr. Richardson (with whom I then first became acquainted,) thought worthy of insertion in his "Journal of Public Health."* And this made me think, when the idea of our Health Congress was started, that a comparison of the Mortality and Public Health of Hastings at the present time, with its condition at that former period, would be a legitimate and not uninteresting mode of occupying twenty minutes † of your time. I ought to state at the outset that this comparison will not be complete and exhaustive, for want of time; and also that it will not be minutely accurate, partly because the geographical areas do not exactly correspond, partly because in one case the year has been divided into *quarters*, and in the other into *seasons*, and partly because of certain alterations introduced into the Statistical Nosology adopted by the Registrar General. However, the comparison will, I think, be sufficiently precise and definite for our purpose here to-day, and the result will be found in all respects highly satisfactory.

We will begin with the death rate in proportion to the population, which is one of the best and most obvious tests of a healthy district. The actual number of the inhabitants of a town is always more or less uncertain, except in the few years immediately following the decennial Census; and I am inclined to think, that, when the population of this Borough is estimated at 55,119 in 1888, the figures are somewhat too high. I shall, however, adopt the calculations of the Officer of Health, as they are evidently made with great care, and I have no means of correcting them. In 1855 I reckoned that in the ten years, 1845-'54, the average rate of mortality was 18·87 per 1000; the highest being 25·36 in 1849, the Cholera year,—the highest in an ordinary year being 21·94 in 1850, and the lowest being 15·80 in 1854. This was considered at the time to be a satisfactory rate of mortality, as the late Dr. Farr then stated that out of 222 Town Districts, there was *one* in which the annual death-rate was 16 per 1000, *two* in which it was 17, and *seven* in which it was 18, of which last Hastings was one.* At the present time we find from the Reports of the Officer of Health that during the last ten years the average rate of mortality has been 15·81 per 1000, the highest death-rate having been 18·16 in 1880, and the lowest 13·17 in 1888.

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* No. 4, December 1855, and No. 6, July, 1856.

† The time allotted to each paper,—which, however, was in several instances exceeded.

And this state of things must be regarded as exceedingly encouraging, whether it be compared with that in Hastings five and thirty years ago, or with the average death-rate in the present day. According to the last Annual Report of the Registrar General, the average mortality for ten years throughout all England was 19·9 per 1000, and in the County of Sussex 16·3. In Hastings, as in all other health resorts, the visitors, and especially the invalids, form an important part of the population; but in this place, more perhaps than in most others, they exercise a considerable influence on the rate of mortality. And the reason for this is evident; it is because so many invalids are sent hither, not with any hope of cure or even permanent benefit, but merely that they may have the comfort of a warmer climate in their last days. Accordingly, some (who probably were not in a fit state to leave their home at all), die within a few weeks (or even days) after their arrival; others get through the winter pretty well, but are carried off by the ungenial spring of this country; while others derive so much advantage from their stay here, that they go away for the summer and autumn, and return for the winter year after year, but leave their bones among us at last. Thus the mortality of the place is increased to a greater extent than most persons are aware of, and this fact should always be taken into consideration when comparing our death-rate with that of ordinary places. The average annual number of persons dying for the last ten years has been 716·30, and of these no less than 117·10 (or 16·34 per cent., or rather more than one-sixth part), have been strangers, and for the most part invalids — sixty-three dying in the first half of the year, and fifty-four in the second.

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* Appendix to the *Report on Public Health, &c.*, p. 208.

But it is not only the actual number and proportion of deaths occurring in a place that is of interest and importance; we should also examine the causes to which they are attributed. And here we may notice the gradual, but steady improvement in medical registration as shewn by the substitution of more scientific nomenclature for the vague and ignorant phraseology of earlier days.

The most interesting and important class of diseases is the zymotic, which comprehends (among others) small-pox, measles, scarlet fever, diphtheria, whooping cough, fever, and diarrhœa. This is the class of specially preventible diseases, as being specially influenced by defective sanitary arrangements; and this is the class to which, when any unusual mortality arises, the excess of deaths may generally be attributed. In 1855 I stated that the average of the deaths from this class was 3·49 per 1000, the lowest rate being 1·46 in 1844, and the highest being 8·18 in 1849, the Cholera year; and this rate of mortality was then considered low, when compared with all England, and still more so when compared with other ordinary town districts. Now, however, the death-rate per 1000 during the last ten years from zymotic diseases has only once been as high as 2·16 (in 1880), while once (in 1888) it has been as low as 0·47. With respect to particular diseases, the three that were most fatal in former years were whooping cough, diarrhœa, and fever; but now the deaths from fever have very much decreased, while those from measles have become much more numerous, so that in the last Annual Report of the Medical Officer of Health it is mentioned that "for the first time since 1874 there were no deaths from measles in the Borough; the annual average being 10."

There is another cause of death that deserves especial notice, viz., *phthisis*, which in this place, as elsewhere, is the most fatal of all diseases. In 1855 I calculated that about 31½ of every ten thousand inhabitants died of this disease, which was a higher proportion than throughout all England. This was accounted for by the number of visitors who are carried off by phthisis, and also by the fact that many persons, having resided several years in Hastings on account of impaired health, are reckoned as inhabitants, who originally came from other places, with a constitution highly predisposed to tubercular disease. The same remarks apply to the present time. The average of deaths from phthisis during the past eight years was 98, the largest number being 112 in 1883, and the smallest 70 in 1881. These 98 deaths represent roughly 13·68 per cent. of the total mortality, and 20·85 per ten thousand of the estimated population. These figures are lower than those of 1855, but I am inclined to think that the apparent decrease of fatality is caused rather by more careful registration than by any diminution of the disease itself. The mortality from this cause was in 1855 larger in Hastings than throughout all England, and such is still the case; for the Registrar General, in his last Annual Report, says that the deaths due to it in 1887 were only 15·91 per ten thousand living, having been 17·52 and 17·18 in the two preceding years respectively.

We were reminded yesterday by Sir Edwin Chadwick that *"the proportion of deaths of children under one, or more completely under five years, to the total deaths, we deem the best index to the sanitary condition of a place, as children are mostly on the spot, are most affected by the local sanitary conditions, and the least affected by occupations, by migration or emigration." I did not apply this test in 1855, but I find that during the last 8 years the deaths of children under 5 years ranged from 162 (or 22·45 per cent. of total deaths) in 1888 to 255 (or 34·58 per cent.) in 1884, which may be considered a moderate proportion.

In 1855 I divided the year into four seasons, reckoning the three coldest months (December, January, and February), as *winter*, and the three hottest (June, July, and August), as *summer;* and as I analysed the Registers for myself, I was able to distribute the deaths accordingly. I found that the average number of deaths increased regularly from 21·09 per cent. in summer to 28·66 per cent. in spring. There is no reason to think that these proportions would differ materially at present, though the *quarters* do not at all correspond with the *seasons*, the *first* being the most fatal, then the *fourth*, then the *second*, and the *third* the most healthy. But if the winter and spring *seasons* be added together, and compared with the first and second *quarters*, and the summer and autumn *seasons* be compared with the third and fourth *quarters*, the results will not be so very different. The deaths in the winter and spring *seasons* were at the rate of 54·46 per cent., and those in the first and second *quarters* were 52·09; while the deaths in the summer and autumn *seasons* were 45·35 per cent., and those in the third and fourth *quarters* were 47·89.

These figures, which have been given more or less *en masse*, have been sufficient to shew that the general improvement of the public health which has been going on throughout the country, has taken place in Hastings in at least an equal degree. They would have been more effective still if I had had time to lay them before you more in detail. I should then have entered into some particulars respecting the principal epidemics of former years (of which, of course, the cholera of 1849 was by far the most severe), and though I cannot say that we are quite exempt from these visitations even now, yet it is perfectly agreed that they are by no means so fatal as they were forty years ago.

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* See page 101.

And now you may fairly ask whether any precise and definite causes can be assigned for this diminution of the mortality of Hastings, and this improvement of the Public Health. And to this question I would answer, that I can with confidence assign three causes for the improvement, one of which applies to the whole country, and the other two belong exclusively to this Borough. The Public Health Act of 1872 gave a great impetus to sanitary reform throughout the kingdom by imposing various duties on the Municipal Authorities which I need not enumerate; and it has borne good and abundant fruit in this place, of which the Main Drainage and the new Waterworks are sufficient evidence. Both these great works have been carried out in a large and liberal spirit, but (so far as I am aware) without unnecessary or reckless extravagance; and they reflect great credit on the Authorities, who have begun to see some of the results of their enlightened expenditure.

Besides these three chief causes of the improvement of the public health, I think I may mention two others of a more private nature, carried out by individual energy. The "Sanitary Aid Association" has been of much use, both in assisting the removal of cases of infectious disease from their own homes, and thus preventing its spreading to the other members of the family, and in various other ways. It was not originated, perhaps, with all the discretion that so good an object deserved, but the beneficial results of its humane endeavours are now fully recognised.

The other matter that must be noticed is the improvement that has taken place in the dwellings of the poorer classes in some of the older parts of Hastings, the extent of which can only be appreciated by those who remember personally the state of things forty years ago, or who have read the Report of Mr. Cresy, the Government Inspector.* The influence of this factor of improvement admits of almost positive demonstration ; for I made a list of all the localities in which any infectious diseases were prevalent in those early days, and it now appears that these are (as a general rule) no more unhealthy than the other parts of the town inhabited by the poorer classes. I allude particularly to East Hill Passage, Crown Lane, Carpenter's Passage, The Merry Christmas, Lennox Street, and other places, some of which no longer exist, and all of which are rendered much more habitable than they ever were before. In this good work I may be allowed to say that the "Hastings Cottage Improvement Society" has for more than 30 years taken an active, but quiet and unobtrusive part.

I have spoken of the past, which is encouraging, and of the present, which is cheering, and in both periods it may be said that Hastings appears to advantage when compared with other similar places. And what shall I say of the future? What will be my *prognosis?* I should say, decidedly favourable ; there is every reason to believe that the *patient* will go on improving to an indefinite extent. And if I cannot quite agree with our veteran sanitary reformer, Sir Edwin Chadwick, who, with youthful enthusiasm, confidently anticipates a golden age, when our death-rate will be reduced to 8 per 1000; † yet I believe that it will still continue to diminish, and that Hastings will always be found comparable on advantageous terms with any other of the health resorts of the kingdom.

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* "Report to the General Board of Health on a Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants, of the Town and Port of Hastings, in the County of Sussex, by Edward Cresy, Esq., Superintending Inspector." London, 1850.

† See p. 102.

NOTES.

The following extracts from Mr. Cresy's report refer to some of the localities mentioned in the preceding page :—

"No. 12, WELLINGTON COURT, behind the King's Head [Courthouse Street] St. Clement's.—Mrs. Sarah Fuller pays 5s. 6d. per week and all taxes; she makes up twelve beds, and never allows more than two persons to sleep in each. In this lodging-house there is neither sink, privy, nor a supply of water. All refuse is thrown into the middle of a court only ten feet in width. The son of Mrs. Fuller was ill in bed, and herself had been attended for cholera." (P. 41.)

"EAST HILL PASSAGE, All Saints.—James Harris makes up 13 beds; he pays 5s. a week rent and all taxes. One privy serves two houses, and is now full to overflowing. The floor of the room appropriated for these wretched lodgers to sit in during the day was wet with the filthy water which drained from the privy." (P. 41.)

"CROWN INN YARD, All Saints.—James Huggett makes up 13 beds; the old stable loft is converted into a sleeping apartment. The living-room is 13 feet square, and in it 15 persons, male and female, were congregated in the middle of the day. In the loft were twelve beds, placed on a temporary floor laid upon the tye-beams; the only light was admitted by two squares of glass, introduced in the plain tiling. Mrs. Huggett's arrangement with the landlord of these premises is to give him half the money she receives from the lodgers, she performing the cooking, washing, and finding coals and candles for the lodgers, who each pay 2s. per week." (P. 41.)

"BOSSOM'S SQUARE.—There are four houses, one of which is occupied by Grisbrook, a bricklayer, who recovered from an attack of cholera. Upon examination of his house, in which lived eight other persons, it was found to be without proper drains, and a tub, instead of a privy, without cover, retained in each room, and emptied only when positively full. There was a cesspool, but it was overflowing, and 'no one's business to cleanse it.' At Maybourne's residence there were two cases of cholera; one girl died. Mrs. Freelove's was much complained of for its imperfect drainage; there was no way for the superfluous waters to escape, and their fetid odour no doubt produced the illness so general in this locality. There were not less than eight cases of cholera." (P. 43.)

"THE plans and sections of MEADOW COTTAGES, and a detailed plan of the lodging-house called the MERRY CHRISTMAS [No. 59, All Saints' Street].—This plot contains 9 houses, not one of which has any water supply, and those marked 1, 2, 3, 4, 5, 6 and 7, have no ventilation. The privy and dust bin at the end are on a level with the dwelling, No. 7, with a high wall on the south side. All the tenants complain of the privy of the adjoining premises, which, in summer, is unbearable." (P. 44.)

"THE plan of FLORA COTTAGES [East Hill Passage] shows two five-roomed cottages, which have no water supply, and injured by the constant overflowing of the cesspool under the privy. One of these cottages is occupied by Mr. Harris, his wife, and four children ; a man and his wife, and three children, and a man and his wife and six children ; in all, 19 persons, who are, it is stated, generally ill. The second cottage is occupied by a man and his wife and three children, and a man and his wife and two children ; nine persons altogether." (P. 45.)

"GINNER'S COTTAGES IN EAST HILL PASSAGE.—They are all built on the side hill, and are in a wretched condition ; the privy, placed on the highest ground, flows, when full, over all the apartments, and finally is discharged into the street." (P. 46.)

* * *

FARM YARD SANITATION,

By G. T. B. WATTERS, M.D.

It is not a little surprising that in this age of improvements in sanitation, when the cry for pure air, pure water, pure milk, is heard on all sides, the insanitary condition of our farm yards should hitherto have received but scant attention. However this may be accounted for, it is time that these should share in the tide of sanitary reform which rises higher year by year.

In the large question of sanitary legislation for our great communities, the humble and patient occupants of the farm yard, upon whom we so largely depend for our national food supply, have been overlooked.

When we take in the morning milk brought to our door, we have a vague impression that there is a kind of government guarantee with each quart; that no thought of added water or dreaded microbes need disturb our equanimity. We are assured that Government Officials of one sort or another exercise the strictest supervision over every drop of that innocent-looking fluid from the period that it enters the milking-pail until it reaches in safety the consumer's table.

It may, perhaps, disturb this feeling of cheerful confidence in existing measures for the consumer's benefit, if we take the trouble to visit the homestead of the dairy farmer, and there study the question for ourselves.

We are all accustomed to the pictures of rural life and pastimes so commonly seen adorning the walls of the coffee rooms in many of our provincial hotels. "The English Farm Yard" is always a favourite; and what a picture of rural felicity have we here represented! The sleek, well-fed horses, the patient kine with drowsy contented look, stand up to the knees in the bright yellow straw, amongst which the plump and pleasing pigs are disporting. The lively ducks and geese shake from their brilliant shining feathers the crystal water of the pond, over which the skimming swallow darts. The very barn-door fowls, strutting in the foreground, wear an air of complacent serenity. The rosy-cheeked milkmaid, in kirtle and gown, her pail on her arm, pauses on her way to the dairy to exchange a little gossip with John the ploughman leaning on the gate.

This is something like the picture we have before us when we speak of an English Farm Yard. How far this is from being a true representation of the existing condition of many of our country homesteads, it is now my business to show.

We will suppose our visit paid in one of the winter months, when the cattle are not allowed to roam the fields, but are penned in yards at the homestead. We are made aware of our approach to our destination by a vigorous ammoniacal odour which greets our sense of smell. The front of the dwelling-house may be reached by passing through a garden, but very often by picking one's way through the cattle yard. Going through the house in the former case, we step directly into the cattle yard, and if you are not careful, you may easily step over ankle in the liquid sewage which is the origin of the odour just mentioned. The yard is generally provided at the side with a narrow shed, which affords a partial shelter for the cattle, which are otherwise exposed to all winds and weathers. The cattle are fed from large wooden boxes containing fodder, standing here and there in the yard, round which the miserable mangy creatures gather. There they stand, day after day, week after week, up to their knees in liquid sewage; their sides and haunches, too, plastered with the same in a partially dried condition! What wonder that their coats look ragged and mangy!—And then the pigs! Whatever their original colour may have been, they are now reduced to a dull uniformity of appearance—not a clean spot on their bodies from tail to snout!

The other occupants of the yard are in much the same miserable plight.

When it rains, a considerable portion of this sewage finds its way into a pool of dark brown liquid, which is carefully constructed to receive it. This foul-smelling pool you might think is a sewage tank—Oh, no; that is the drinking water provided for the cattle!

It is now milking time. A man whose clothes are redolent of cows, stale cider, and tobacco, in a not over clean smock frock, proceeds to milk the cows. He drives a cow into the shallowest of the sewage, and seats himself on the milking stool. But surely he will wash some of that filth from the cow's udder, or at the very least from his own dirty hands? Oh, dear, no; sewage and all go into the pail. And so the process is repeated.

It is thus apparent that an addition of *water* to the milk may not be the worst form of dilution.

This is not a fanciful, or even an exaggerated picture, and it may surely be said that some improvement in the sanitary condition of our farm yards is urgently called for.

It may be pointed out that there is a serious loss of food for plants by this method of keeping cattle in open yards. A very large per centage of manure is washed away into ditches and streams, causing their pollution. It is impossible to calculate accurately the amount of valuable plant-food thus wasted, but I should think one-third is within the mark.

In outlying country districts it often happens that a stream which affords drinking water for a number of houses is polluted along its course by drainage from farm yards. Indeed, the yards will be found purposely arranged so as to drain into the nearest stream.

The cattle themselves are unhealthy. Where there is uncleanliness and bad sanitation, there you have unhealthiness; dirt and disease go together.

Parasitic growths, animal and vegetable, which are common in cattle, spread unchecked from one to another. If the cattle are kept in an unhealthy state, and in filthy surroundings, breathing an ammoniacal air, they will not yield as much milk as under opposite conditions; or if they are being fattened for the market, they will not put on as much flesh. This has been abundantly proved by the experiments of Sir Edwin Chadwick. More attention, therefore, given by farmers to the cleanliness of their stock would be well repaid by their increase in health and usefulness.

It has been proved that the tuberculosis, so common amongst cattle, is identical with this disease in man, and moreover that it may be communicated from a diseased animal to man, either through partaking of the flesh of an animal suffering from the disease, or by drinking the milk from an infected cow. When I state that tuberculosis is accountable for one-fifth of the total deaths in England, you will understand the importance and gravity of this question. May not the insanitary conditions in which our cattle spend so much of their lives, be responsible for the wide-spread prevalence amongst them of this serious and dreaded transmissible disease?

It has been computed by an Inspector of one of our Metropolitan Meat Markets, and he is confirmed by Dr. Alfred Carpenter, that over 80 per cent. of the cattle sent there suffer from tubercle; and in fact, to stop all the tuberculous cattle would leave the Metropolis without an adequate meat supply.

Here, then, we have some grave facts to consider, and it may be asked whether this plainly preventible source of infection is adequately recognised, or suitably provided against?

In making suggestions for the better sanitation of our farm yards, the following points might be taken into consideration:—

All stagnant pools in the neighbourhood of farm houses should be done away with.

The cattle, when not allowed to be in the fields, should be kept in covered cow houses, or well ventilated sheds, where they could be tied up in stalls, provided with mangers and water troughs, having a constant supply of pure water.

The bedding should be carefully attended to—peat moss litter is much to be preferred for this purpose.

No covered drains should be used in the sheds, but only such as can be easily kept clean. The sewage could be collected in a suitable receptacle at a distance from the sheds. There would thus be a considerable gain to the farmer, as a very large amount under the present method is washed into the neighbouring brooks.

The cattle themselves should be kept clean, and well brushed and groomed daily.

The hands of the milkers and the udders of the cows should be washed before milking.

The dairy should be built separate from the dwelling-house, and ought to be used only for the storing of milk and its products; not, as is too often the case, as a meat larder and beer cellar as well.

There seems no good reason why, amongst all our domesticated animals, our cattle should be compelled to live in a state of filth and in unwholesome surroundings, such as are most calculated to produce disease. It is time, therefore, that the light of public opinion should be turned on these dark and dirty places in our midst, and that we should be roused from our apathy and ignorance. We may then hope for some improvement in the sanitary condition of our farm yards, which are at present a source of danger to the community, and a disgrace to our boasted civilization.

THE METEOROLOGY OF HASTINGS.

By HENRY COLBORNE, M.R.C.S.

It is necessary, and I hope it may be interesting, before considering our subject, to give some short account of the means by which the present knowledge of our climate has been obtained. Like most other branches of science, meteorology has made great strides of late; in fact, during the last eighteen years it has advanced very considerably in scope and exactness. Observing stations have multiplied in all countries, and, what is more important still, the accuracy of the observations taken is infinitely greater than in former years. Not only are the instruments employed more accurate, but new instruments have been added, and uniformity in the manner of observing has been secured; thereby strict comparisons may be now made in most instances, which could not formerly be done. The Royal Meteorological Society has done much to bring about the uniformity and the greater exactness of observations at the present day, and the telegraphic system of the Government Meteorological Office has likewise worked in the same direction. Fortunately for the progress of meteorological science, there has existed a friendly relation for many years between the Society and the Government Office, and, as it should be, a sort of competition is carried on between them in scope and usefulness. One could wish, perhaps, that the published results of meteorological research were in some instances more speedily obtainable, but the work is very great, and it is astonishing what a lot of labour may be represented by a few figures. All meteorological observations taken in this borough prior to those of Mr. A. H. Wood, of The Hollies, and those of Mr. A. E. Murray, of Manor House, were unfortunately taken on what may be called the old system of observing, and are consequently not very useful for the purpose of comparison. To these gentlemen is due the credit of discarding the old wall and window screens, and adopting the isolated and closed thermometer screen, from which, as is now well known, accurate shade temperatures can alone be obtained. Thus the otherwise excellent tables of temperature, published by Dr. Mackness in 1850, by Mr. Savery in 1868, and by a few other lesser authorities prior to about 1877, are of little value for comparison with those now taken. Dr. Parsons, in his pamphlet, entitled "The Highlands of Hastings and St. Leonards as a Health Resort," makes use of the observations by Mr. Murray, as well as those by Mr. Savery, and it can there be seen how different are the results of the two observers. For instance, taking

THE AVERAGE DAILY RANGE,

according to Mr. Savery, it is 8·6 degrees, and according to Mr. Murray, it is 10·5 degrees. It has since then been proved that the latter amount is about the average daily range of shade temperature in Hastings, and that the lesser amount given by Mr. Savery, being obtained, doubtless, from a wall or north window screen, the range was thereby contracted. Such screens are still used, particularly in cold countries, where the observers in many instances read from a window. Not only is the daily range of temperature contracted by the use of either the wall or window screen, but the seasonal range is likewise contracted, the artificial warmth around dwellings preventing thermometers sinking to the proper point in winter, and preventing the full influence of the warm air in summer from reaching the thermometers, this latter fault being most noticeable the larger and more angular the building. The excellent ten years' series of observations taken by Dr. Mackness, in Wellington

Square, commencing January 1st, 1839, and terminating December 31st, 1848, strange to say, however, give results very little differing from those taken now with all our improved appliances, and as the best series of observations ever taken in Hastings on the old system, I cannot help quoting the chief results obtained. Were a Stevenson's screen with Kew verified instruments erected in Wellington Square, and read daily for a like period of ten years, I doubt whether the results would show many important differences. So much for the patience and painstaking love of accuracy found in most of our old observers. Dr. Mackness gives the mean temperature of the different months thus: January, 37·6 degrees; February, 38·1 degrees; March, 42·0 degrees; April, 47·4 degrees; May, 54·0 degrees; June, 61·6 degrees; July, 61·1 degrees; August, 59·2 degrees; September, 57·5 degrees; October, 55·5 degrees; November, 53·5 degrees (this value is, of course too high); and for December, 41·6 degrees. For the seasons he gives spring, 47·7 degrees; summer, 60·6 degrees; autumn, 55·2 degrees; winter, 39·1 degrees. The mean temperature of the whole year is thus 50·7 degrees. The extremes are not recorded, and a comparison of temperature taken at his residence in Wellington Square with some others taken by Mr. Ranking in High Street, are unfortunately not complete or worked out, but sufficient is given to show the still more contracted range of daily and seasonal temperatures in the latter locality, rightly being attributed to the more protected situation of the Old Town. It is not to be wondered at that in a health resort such as Hastings there have been very many careful meteorological observers, who for years have patiently registered their daily readings, perhaps never intending that the results of their labours should see the light. Thus there have been to our knowledge several extended series of systematic readings of barometer, thermometer, rain and weather observations, which, in all probability, have or will be destroyed. A few extracts have been, from time to time, published in our local papers when any unusual phenomenon has occurred, but we know of no complete series having been published. The late Mr. John Banks, of Bleak House, published for some years his observations in the *Hastings News*, but unfortunately he gives no results, and perhaps, what is still more to be regretted, his thermometer screen, being a small one placed on the north side of a wall, often got over-heated by reflection during the day, and the radiation from the thermometer bulbs by night was very detrimental. Before quitting our notice of what we may call

THE OLD SYSTEM OBSERVERS,

we should mention the labours of Mr. John Phillips, who for nine years patiently observed for the Hastings Literary and Scientific Institution in George-street; also those of Mr. F. G. Lloyd, of the Croft. Further back still, the published tables of Dr. Harwood, giving the climate of St. Leonards and Hastings from observations taken in both towns, and the excellent ones of Dr. Savery may even now be consulted with advantage. A valuable book might be written giving all known results of meteorological observations taken in the borough. Indeed, it is a pity that something of the sort is not attempted. As well as observers in the town, there are others who, for many years, have systematically recorded daily readings but a few miles outside, whose labours would be most valuable in helping to form a correct idea of the climate of the country around. Amongst these might be specially mentioned Mr. Rock and Colonel Lewis, of Hollington, and Mr. Charles Murray, of Ore. It is as Mr. Glaisher remarks, "not the want of observations, but the want of brains to work them out," and so it appears it will ever be the want most felt. Much that is very interesting, especially to those with that peculiar love for meteorological reminiscences, might be written on the history of the records of our Hastings climate. One thing is always very striking, namely, the love with which all observers have gone at their work. The thermometers have been obtained unmarked upon their stems and unverified, hung up in window recesses, or upon garden walls; barometers made on faulty principles, employed to correctly determine the atmospherical pressure; and the observations recorded without any corrections for altitude of instrument, temperature of its mercury or of the outside air; rainfall diligently collected in gauges carefully protected by overhanging roofs and gables. Yet who does not almost the more for that prize the antiquated-looking "Table of results?" The poetry, as in most things, seems to have gone out of even meteorology, and the cold and painfully exact methods of observations enforced by the "Authorities" take much from the real beauty and interest of our present-day weather records. But science is ever upward and onward, and whatever interest may wrap itself around the old Croft records which tell us the tales of Hastings summers fifty years ago and more, when the town, before its astonishing growth, lay between those two lovely hills, the East and the West, must all give place to the requirements of the present time, and for the correctness of the results now required we are perforce thrown upon the new system of observation. This may be said to have been begun when the Meteorological Office recognised the observations taken on the West Hill by Mr. Murray. Since then, Hastings has continued to be one of the Government observing stations, and upon the results obtained are the following figures based. It should, however, be stated that unfortunately for strict uniformity, the Hastings readings were discontinued at the end of 1879, and the present observing station at St. Leonards started. Little, if any, difference seems to have resulted from the change, as the two positions are similar in many respects, and the mode of observation exactly so. The results from both stations have been over and over again published, and the regret for want of publicity which attaches itself to former records cannot possibly exist with the new series. As well as weekly and monthly summaries, the Meteorological Office publishes a large yearly volume giving the observations *in extenso*. The local papers are likewise freely supplied with the daily readings, and a copy of the temperature readings, "Sunshine and rainfall observations" regularly forwarded to the Town Hall, open to the inspection of anyone interested. Together with the excellent Annual Report of our painstaking Medical Officer of Health, Mr. C. Knox Shaw, an account of the temperature, sunshine, and rainfall is regularly given, so that it is only necessary here, in order to avoid confusion from a multiplicity of figures (a thing very easily brought about), to give

THE MOST IMPORTANT RESULTS

from the St. Leonards series of observations, coupled with those taken by Mr. Murray on the West Hill when necessary. From them the mean height of the barometer column at mean sea level, and corrected to 32 degrees Fahrenheit, is found at the hours of 9 a.m. and 9 p.m. combined to be about 29·96. The mean shade temperature deduced from the maxima and minima readings, without any correction whatever being applied, but for the errors of the thermometers, is 49·4 degrees at an elevation of about 165 feet above the sea. Spring averages, 45·9 degrees; summer, 59·9 degrees; autumn, 51·5 degrees; and winter, 39·9 degrees. The mean daily range is 10·4 degrees, the day temperatures averaging 54·6 degrees, and the night 44·2. The thermometer during the year ranges on an average through 60 degrees, namely, from 20 degrees to 80 degrees, the highest point ever reached during the registration of temperature in a closed screen being 86·6 degrees in the year 1885, and the lowest 16·7 degrees in the year 1881. The mean humidity deduced from the 9 a.m. and 9 p.m. readings is 838 (saturation being 100). The most prevalent wind is W.S.W., the estimated force being 2·7 on the scale 0 to 12. The mean amount of cloud at the same hours is 5·7 on the scale 0 to 10. The mean rainfall at about 160 feet above the sea is 29·95 inches, falling on an average of 183 days. The mean number of hours of bright sunshine registered yearly is 1,706, and 73 days are generally found to give no registration at all. Although the sunshine recorder has been invented several years, it is only within about the last ten that uniformity in the style of instrument, and thus uniformity of registration, have been secured. There is consequently no extended series of results from any meteorological station yet obtainable; but, speaking generally, the South Coast of England enjoys the greatest amount of bright sunshine, and Hastings, being on that coast, is amongst the sunniest of all the places on the mainland. The Island of Jersey has undoubtedly more sunshine than we have, and the recorder at Ventnor, Isle of Wight, appears to register about the same as our own. It is unfortunate that no sunshine reports are furnished from such places as Folkestone, Ramsgate, Margate, Southend, Lowestoft, or Yarmouth. The first two (Folkestone and Ramsgate) may, owing to their more easterly position, have a larger number of hours of clear sunshine than ourselves, but it will probably be found that the other places further north have a trifle less. From the fact that this south-east corner of England is farthest removed from the large majority of storms which come in from the Atlantic, passing, in a north-easterly direction, over Ireland and the north of Scotland, we shall for ever owe our climato-logical advantages. During the passage of a storm-centre in the direction mentioned, it can be readily understood why the South-East Coast of England should, as a rule, be the last place to cloud over, and the first place to clear. The mean amount of cloud towards the east end of the South Coast has long been shown to be below other places in England, and the

SUNSHINE RECORDERS

at present established along the coast-line show the diminution in the amount of hours registered as you go westward. Thus, the sunshine recorder at Eastbourne invariably registers during the year less than ours, and that at Southbourne (near Bournemouth) less than the one at Eastbourne. The registration of shade temperature is at the best but a very unsatisfactory thing, mere local surroundings influencing the thermometers considerably, so that, from no single set of readings is it possible to form a correct idea of the mean temperature of a town or any extended district; but all observers agree that Hastings has a small daily range, and the official reports now given show that it is but a trifle over 10 degrees, being probably less than that of any other locality on the mainland, except the most sheltered parts of the South-West coast, where the air is warmer and damper, the range being contracted by the excess of moisture. Our small daily range is, of course, due to the uneven character of the ground in and around the borough. The night radiation is small, and by day the undulating surface receives its heat unevenly, and a sort of compensation is established, our natural protection from the cold winds (W.N.W. to E.N.E.), assisting likewise in preventing us experiencing the extremes of cold in the winter season. With regard to the clearness of the air, the sandy and porous nature of the soil for the most part chiefly accounts. Watery accumulations upon the land are uncommon, the rapid absorption carrying off heavy rainfalls in a few hours. There is but little invisible vapour hanging over the land, and, our radiation being sluggish, the little invisible vapour that does exist very seldom gets converted into visible mist by any rapid cooling of the ground.

THE WINDS

of the district partake, of course, of the general character of those experienced on the South Coast. There is known to be a tendency to an increase of mean force at the extreme east and west ends of our South Coast, calms being seldom experienced; this fact likewise helps in keeping away accumulations of mist. Our liberal rainfall of about 30 inches yearly aids greatly in clearing and purifying the air. It does not appear, however, to fall on more days than in other parts of the country, but we are frequently visited by short and heavy falls of about ·20 to ·40 of an inch, which bring up our total some two or three inches above many other rainfall stations only a few miles distant. Our yearly rainfall is at least four inches more than that of London and its surroundings. On the whole we are very much blessed, and have consequently very much to be thankful for in our beautiful climate—the main requisites for the preservation and, perhaps, restoration of health, we possess. A temperate and comparatively even climate, open and bracing, more than our share of bright sunshine (Nature's head physician), and a liberal rainfall—the most efficient of all sanitary officers.

THE ABATTOIR SYSTEM.

By H. F. LESTER, LL.B., Hon. Sec. "London Model Abattoir Society."

UNDERLYING our civilization at the present day there is the grimly disagreeable system by which our tables are provided with animal food.

This is not a fitting occasion for enquiring whether the supposed difficulty of maintaining our bodily strength without partaking of such nutriment, is real or imaginary; whether, as we are usually taught at an early period of our existence, oxen and sheep were created in order to be converted into beef and mutton, or whether the meat-eating habits of society are not a gigantic and ruinous mistake. We have to take the fact of this meat-eating habit as we find it, and we must acknowledge that for a very long time to come, animals will continue to be killed in order to supply us with food. The duty, therefore, is incumbent on us to see that the very unsavoury process of terminating the existence of edible animals is carried on with all possible regard to considerations of humanity, as well as in the way most consistent with the health of the community.

Does the method of providing us with meat, now existing in this country, fulfil these requirements? Is it at once as humane and as sanitary as it ought to be? It is impossible for anybody acquainted with the condition of slaughtering places, to answer the question in the affirmative. We have proceeded in England, on the national principle of allowing the wants of the whole community to be catered for by private enterprise. We have allowed every butcher who is so inclined to kill the animals he buys on his own premises, only requiring of him that certain regulations regarding cleanliness and distance from dwelling-houses shall be complied with.

The result is, that in London alone, a few years back, there were twelve hundred private slaughter-houses; a number which has now been reduced to somewhere about eight or nine hundred. In every town in which the Municipal Authorities have not built an Abattoir, or Public Slaughter-house, the same state of things exists on a smaller scale. The defects of private killing places, as they exist in London, were set forth some years ago in the *Animal World*, and in a pamphlet published by the "London Model Abattoir Society," which embodied the result of a careful inspection of many of these places. It was found that sanitary and humane considerations were habitually violated. The report of inspection to which I have alluded, contains the following suggestive remarks:—

"These buildings (the private slaughter-houses of Westminster, Pimlico, and Lambeth), in very few cases were erected for the purpose for which they are now used. We found that they consisted of the ordinary limited back premises of a small third-rate house; sometimes of a wash-house or back kitchen; at other times, of a roofed-in back yard; or again—and these are the most favourable specimens—of stabling or a shed. In the latter cases, there was sometimes a separate entrance in the rear. In the other cases, the entrance was usually through the shop and past the living rooms of the butcher. The very common arrangement, by which the windows of the dwelling-house look into the slaughter-house, must be exceedingly undesirable, both from a moral and a sanitary point of view. Generally, with respect to construction, it is obvious that no amount of inspection can convert a laundry into a slaughter-house, a back kitchen into proper lairage for animals, or an out-house in juxtaposition to offal-heaps, dust bins, and privies, into a satisfactory larder for the storage of meat."

Here are two specimens of actual slaughter-houses, culled from the same report:—

1.—"A small room behind shop, with side entrance from street. Sheep and oxen killed here. Sheep were being killed on the floor, without a cradle or crutch. Butchers had very confined space in which to kill, owing to the dead meat hanging in the slaughter-house. Floor of stone, with joints defective, and consequently not impermeable."

2.—"Large place, with side entrance. Very bad approach, down a slippery asphalte incline, ending in two stone steps. Two lairs; in one, the animals could not see into the slaughter-house, in the other they could. Here sheep were being killed, having previously—as the butchers informed us—been kept in the lair for three days. No utensils for feeding or watering the animals. Butchers took about a dozen sheep out of lair, and huddled them in corner of slaughter-house while others were being killed. Butchers were men and boys, two of whom were apparently got in for an odd job."

The remedy for all these evils lies in the establishment of Abattoirs, or Public Slaughter-houses, and the adoption of better methods of killing.

Take the one subject of inspection. How impossible it must be to exercise any really effective supervision over what goes on in nine hundred separate slaughter-houses scattered over the area of the Metropolis. Inspection now is devoted to discovering violations of sanitary rules and ensuring the soundness of meat, and is not directed, except incidentally, to checking cruelty; but even this kind of inspection requires, to make it thoroughly effective, an army of peripatetic inspectors always engaged in paying surprise visits. A paper issued by the "London Model Abattoir Society" puts the case briefly, and I believe correctly, when it says:—

"Were twelve large Abattoirs established (round London), instead of 900 existing private slaughter-houses, no inconvenience, but a real benefit, would be done to the trade, while the public would gain enormously by the certainty of being supplied with sound meat, by a probable cheapening of the article, and by the diminution of the intolerable nuisance and danger to health, now occasioned by slaughter-houses being scattered in densely-populous neighbourhoods. A largely decreased staff of inspectors would be able to exercise a vastly more efficient control, both to stop cruelty, and to ensure proper sanitary arrangements." To effect these objects "ever-present inspection can alone be efficacious; and although in one or a few large places, such as Public Abattoirs, this inspection can be readily rendered, in a multiplicity of small places it is impossible."

It is encouraging to know that the principle of concentrating the slaughtering nuisance into a few easily supervised centres, is being increasingly recognised in English towns. The spread of the Abattoir system in this country is slow, but it is continuous. A recent Act of Parliament enabled any town to borrow money for the construction of such places; and a considerable number of Abattoirs have been constructed all over the country, and are in daily use. Up to the beginning of 1887, 28 towns had borrowed loans for the purpose of erecting Abattoirs. The "London Model Abattoir Society" wrote to these places requesting information as to the results which had been obtained. In some few cases, the reply was that the Abattoir was still only in contemplation; but in all the cases where they had been really established, the testimony was that the results were extremely satisfactory, with the single exception of Over Darwen, where financially the plan had not succeeded. Elsewhere the report was that cruelty had been lessened, the detection of unsound meat had been rendered easier, and the number of private slaughter-houses had dwindled, while no pecuniary loss had been incurred.

It was found that other boroughs, besides those which had borrowed loans, had erected public slaughter-houses; among these being Bolton, Halifax, Huddersfield, Leicester, and Manchester. There were no means available for discovering which towns might be enlightened enough to have adopted this course, short of writing to all the boroughs in England. This accordingly was done. The majority sent no reply, silence in their cases no doubt signifying that they had no Abattoirs, and did not care to answer questions addressed by a society to which there was no obligation to afford information.

The fact that there is no official record kept of the number of slaughter-houses, public or private, in the kingdom, and that it is impossible to obtain the information except by an examination in detail of each town and each rural district in the land, is an indication of how little attention has as yet been paid to the whole subject.

Some of the results obtained from this persistent questioning are curious and interesting. Halifax, for example, has 78,000 inhabitants, and one public slaughter-house suffices for its needs; there are no private ones. Bolton, on the other hand, although possessed of an Abattoir, yet at the time of the enquiry, two years ago, was still the contented owner of as many as 34 private slaughtering places. A little town like Lewes has 18 private slaughter-houses for its 11,000 odd inhabitants, while Huddersfield, with 88,000 inhabitants, only has 19. But Huddersfield possesses an Abattoir, so that it can dispense with the multitude of private slaughtering places in which so many small towns seem to abound.

Considering the immense benefit which a town reaps when it establishes an Abattoir, there would be urgent reasons for their erection even at some cost to the ratepayers. But it is found that whenever the experiment is fairly tried, the result is a financial success. In Manchester, where a very fine Abattoir has existed for some years, the original cost was £44,000, and it now returns a profit of 5 per cent. The Liverpool Abattoir, although not a model one, returns a profit of upwards of £4,000 a year to its shareholders. Where municipalities establish Abattoirs, they can, and ought to, ensure their success by limiting the number of licences to private slaughtering places, and gradually allowing these to die out altogether.

Humane people will ask—and have a perfect right to ask—how the cause of humanity is furthered by this system? The answer is, that what is done in a public Abattoir is not hidden from everybody's sight like the doings in a private slaughter-house; inspection is constant, and even if an inspector does not conceive it his business to interfere to check cruelty, yet the mere fact that the men employed are in constant practice—not got in for an odd job—ensures the killing being carried out as skilfully as the faulty methods now employed admit of.

A vast deal, however, has yet to be done, by introducing more painless modes of killing, before the slaughter-house has been humanized as much as it can be, and ought to be. Only after this has been effected can Abattoirs be entitled to the name of Model Abattoirs. That, however, is a subject rather for humanitarians than for a Sanitary Congress to deal with. There is at present a marked tendency on the part of Municipalities to introduce the modern method of Abattoirs in lieu of the barbarous, antiquated, and thoroughly unwholesome private slaughter-house; and this movement is one that sanitary reformers have a special motive for aiding by every means in their power.

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MODEL ABATTOIRS IN BELGIUM,

By E. A. GRATTAN, Esq., late British Consul General for Belgium.

The observations which I am about to make, form a natural sequel to the interesting paper which has just been read to you by the Honorary Secretary of the Model Abattoir Association, and it is a source of great pleasure to me to have an opportunity of saying something on this important subject.

Having had occasion to visit some of the public Abattoirs in Belgium and France, I had no hesitation in accepting the invitation of your distinguished President, to come down to Hastings and attend the Congress. The notice was, however, rather a short one, and I must consequently ask your indulgence, should the information I am able to give you fall short of what might have been desired on the subject.

The institution of public slaughter-houses or Abattoirs, as you are doubtless all aware, is due to the fertile genius of the Great Napoleon, who ordered the construction of the first building of the kind, which was opened in Paris in the year 1807.

The idea was based mainly upon sanitary considerations with a view of removing from crowded localities the sources of infection and danger to health, arising from slaughter-houses left entirely to private management. A hope was also indulged in that the establishment of slaughter-houses, under official control, might tend to facilitate the better treatment of animals.

brought to them for slaughter, as well as the employment of more humane methods of putting them to death. These important considerations have not been altogether lost sight of, although the result of the efforts made to carry them into effect has been hitherto disappointing to those who have taken a special interest in the question.

The general system of Abattoirs prevailing in Belgium, both as regards their construction and management, corresponds in a great measure with that adopted in France, and the principal towns, such as Brussels, Antwerp, Ghent, Liége, etc., are all well endowed with spacious and well-appointed public slaughter-houses, to which in each case, a cattle market is attached. All these are subject to the direct supervision of the Municipal Authorities in each locality, and under the immediate management of a Director appointed by them, who has full control over both the Market and the Abattoir.

The greatest precautions are taken to ensure cleanliness, and the removal of all causes of infection within the limits both of the Market and of the Abattoir.

Minute rules are laid down for the examination of cattle, previous to its admission to the Abattoirs, during the stay of the animal within their precincts, and in connection with the inspection and distribution of meat, offal, and refuse of various sorts.

The Antwerp Abattoir, which is a fine specimen of its class, was opened in the early part of the year 1878, and its use became obligatory on the 1st of July of that year.

The following are amongst the principal rules and regulations promulgated by a decree of the Municipal Council :—

1.—The executive officers, including the Director and the three Inspectors are precluded from filling any functions or holding any office beyond those appertaining to the Abattoir.

2.—The Director is responsible for the maintenance of order, and takes all necessary measures to ensure the cleanliness and the salubrity of the Abattoir, the cattle market and their dependencies. The care of the buildings, furniture, and various utensils, also devolves upon him. He is bound to report the appearance of any contagious disease amongst the animals. A general inspection of all the premises takes place at least twice a year.

3.—Before entering upon their duties, the principal officers connected with the Abattoir, namely, the Director, the Inspectors, the Experts, the Receiver, the Clerk, the Superintendents, and the Weighers, take and subscribe an oath before the Burgomaster, "truly and faithfully, without fear or favour, to execute and administer their respective functions."

4.—It is the duty of the Inspectors and Experts to visit the various provision markets, and all other establishments in the town where fresh, salted, or smoked meats are sold, to ascertain whether the meat offered for sale has been verified and bears the stamp of the Abattoir, and further to seize and confiscate any meat which may be found to be unfit for human food. Poultry and game are also subject to inspection.

5.—The inhabitants of other townships are permitted to have their cattle slaughtered at the abattoir, on the same terms as those to which the citizens of Antwerp are subject.

As regards the physical process of slaughtering, some regulations bearing upon the point exist. The killing of all animals shall take place exclusively within the enclosed spaces (échaudoirs) set apart for the purpose. The master butchers owning beasts are required to be present during the operation of slaughtering. Bulls and bullocks are to be carefully secured by means of ropes or nose rings when removed from the stables to the échaudoirs (the outer doors of which, when leading into the open adjoining streets, must be kept closed), and fastened to a ring let into a stone trough as a precaution against accidents, but no regulations, whether applying to the markets or the slaughtering of beasts, appear to have been conceived with a special view to the more humane treatment of animals brought to the Abattoirs to be slaughtered.

This matter has, however, occupied serious attention in Belgium, and both the Brussels and Antwerp Royal Societies for the Protection of Animals, have devoted much time to the consideration of the subject. Various experiments have been made in Brussels as well as Antwerp, especially with the object of lessening the sufferings of horned cattle. The method which appears to have proved as yet the most successful, is that adopted by Mr. A. Vandenvelde, and for which he obtained a reward from the Brussels Society in the year 1885, which consists of an improvement upon the well-known mask of Dr. Siegmund, of Bâle. The experiments in regard to this invention, performed at the Brussels Abattoir in the year above mentioned, seem to have been highly satisfactory. The operation is so simple that it can be executed by a mere child. Fully fifty animals may be killed in one shed in the space of an hour. The certificates of various butchers appended to the published report, shewed that the meat of the animals so slaughtered was not in any way unfavourably affected by the proceeding, but rather the reverse. The spirit of routine, however, combined with the opposition of the slaughterman, who imagined they might be losers by the change, has prevented the adoption of this system, notwithstanding the strenuous efforts of the Brussels Society, which reported most favourably upon the subject.

The anæsthetic appliances discovered by our eminent President, Dr. Richardson, and which have been employed by him with such signal success in inflicting a painless death upon the lower animals, are not yet generally known in Belgium. I can only say from my knowledge of the able-minded men who stand at the head of the two Societies for the Protection of Animals in Belgium, that they will hail with heart-felt pleasure any development which may lead to their use in Abattoirs.

In conclusion, I beg to present a series of plans and documents relating to the Abattoirs of Brussels and Antwerp for the inspection of the members of the Congress.

DISCUSSION.

Dr. Richardson said there had been great difficulty in obtaining a site for an Abattoir near London, with which he was connected, but they hoped soon to do so, and then a model establishment would be in operation.

Mr. Parker Rhodes spoke of the cruelty which was inflicted on animals that were slaughtered for food. At the Abattoir the animals were painlessly killed. He should like to see influence brought to bear on the Government that money was necessary, and should be voted for the purpose.

Mr. Councillor Bray said the Corporation of Hastings had, in going to Parliament three years ago, obtained sanction from Parliament to erect an Abattoir in the town as soon as other circumstances permitted. The Council had recognised the importance of the subject. (Applause.)

THE WATER SUPPLY OF HASTINGS.

By P. H. PALMER, A.M.I.C.E.

THE proceedings of this section of the Health Congress on Municipal Sanitation would hardly be complete without a description of the sources of water supply provided for the wants of the population of the town; but I only propose to give an account of the various sources of supply, and the manner in which the water is distributed to the consumer. Hastings is situated in a district, the geological formation of which is extremely peculiar. The Wealden strata is here broken up into numerous faults, some of which are most extensive. The wells in the district from which the larger portion of the town supply is obtained are sunk into the Ashdown sand. Hastings is at present supplied from various sources—wells, headings, and springs. The district supplied by the Waterworks comprises only the Municipal Borough, and does not include the neighbouring and contiguous parishes of Silverhill, Hollington, and Ore. The number of houses supplied at present is about 8,062. The number of inhabitants in the district is about 41,000, to which must be added, in the fashionable season, from 10,000 to 12,000 visitors. The area of the district is considerable, being about 4¼ miles in length from east to west, and 1¼ miles north to south. The ground is very undulating, varying in level from 22 feet above the sea to as much as 350 feet. The sources of supply, and the estimated daily yields, are as follows:—

	Gallons.
Wells at Filsham	500,000
,, Buckshole	270,000
,, Hollington	75,000
,, Martin's Station, near Gasworks ...	40,000
Springs at East Hill and Warren Valley ..	200,800
Reservoirs near Hastings and Ecclesbourne ...	200,000
	1,285,800

The whole of the water of the district is soft; even the hardest samples are soft when compared with chalk waters, or with that supplied to London. The hardest water is about 10·8 degrees by Dr. Clarke's scale before boiling, the softest 5 degrees, and after boiling this is reduced to 4·2 degrees and 3 degrees respectively.

The two wells at Filsham are about 60 feet deep, and the water is raised therefrom by a set of three throw pumps in each well; each set is capable of raising 800 gallons per minute to the level of the engine-house floor. Each set of pumps is driven by a 100-horse power beam engine, and steam is supplied to them from four Lancashire boilers, 24 feet long and 7 feet diameter; the boilers are fitted with corrugated steel furnaces, and are each capable of supplying steam for the working of one engine. The engines are on Woolf's principle, having cylinders 20 inches diameter, and 30 inches; the stroke of the latter being 5 feet 6 inches. The pumps are worked from spurred gearing from the main shaft, and the condensers are placed in the basement of the engine house.

The wells at Buck's Hole pumping station are about 116 feet below the surface, and the machinery consists of two 40-horse power beam engines, each driving a set of three throw pumps, capable of raising from the well to the ground level 500 gallons per minute, and a double acting pump under the beam capable of raising 300 gallons per minute to the highest parts of the town. The surplus water from the well pumps is passed through the condenser, and delivered to a small service reservoir. These engines are also high and low pressure, condensing beam engines, on the Woolf's principle, the smaller cylinder being 16 inches diameter, and the larger 25 inches, the stroke being 5 feet 6 inches. There are three multitubular boilers, each 22 feet long, each one being sufficiently large to supply steam to one engine.

The pumping station at Hollington is situated outside the limits of the Municipal boundary, in the village of Hollington. The wells are about 90 feet deep, and in one a 3-inch bore-hole is continued to a depth of 51 feet below the bottom of the well. The machinery consists of a six-horse power grasshopper beam engine, driving a set of three throw pumps in one well, and a bucket and plunger pump in the other. Each set of pumps is capable of raising about 100 gallons per minute. There are two Lancashire boilers 24 feet long, each capable of supplying steam for driving the engine.

The wells at Martin's pumping station are about 70 to 80 feet deep, and having a bore hole three inches diameter for a depth of 400 feet below the bottom of the well. There is a set of three throw pumps in one well, capable of raising 500 gallons per minute to the level of the engine-house floor, and two double-acting pumps, one on each side of the beam, which take their supply from the three throw pumps, and deliver 300 gallons per minute to a higher level. In the other well there is a set of two throw pumps; and two direct acting horizontal pumps on the same bed plate as the engine. The engine working the three throw pumps is a 30-horse power engine on Woolf's principle, high and low pressure, condensing beam engine, the smaller cylinder being 15 inches diameter, and the larger 25 inches, the stroke of the latter being 5 feet; and the engine working the two throw pumps is a direct acting high pressure horizontal engine of 30-horse power, but as this engine is of an old-fashioned type, and is very costly as to the consumption of fuel, it is seldom used. There are two Lancashire boilers, each 24 feet long, and each capable of supplying steam to one engine.

In order to avoid lifting the water higher than is necessary, and at the same time to prevent undue pressure on the service pipes, the plan has been adopted of dividing the district into four zones, or services, namely, low service, middle low service, middle service, and high service, each fed by its own reservoir or reservoirs, with its own system of main pipes. The districts are connected together, and stop-cocks are arranged so that, in case of fire, the water from the upper can be let down into the lower service mains, valves being fixed on the outlet of each reservoir to prevent the passage into it of the water from the reservoir above. The low service zone is fed from two reservoirs, one close to Filsham pumping station at the west end of St. Leonards, and one at Buck's Hole.

The Filsham reservoir is situated at a level of about 102 feet above ordnance datum, and has a capacity of 500,000 gallons. The Buck's Hole reservoir is about 90 feet above ordnance datum, and has a capacity of 160,000 gallons. The middle low service zone is a small district in the immediate neighbourhood of West Hill, St. Leonards; is fed from a reservoir at West Hill, which is about 145 feet above ordnance datum, and contains about 250,000 gallons. The middle service zone contains about one-third of the whole area of the district, and is fed from five reservoirs, two of which are at Newgate Fields, to the north-west of the town, one at St. Leonards Green in the west, and two at Halton in the east. The reservoirs at Newgate Fields are situated about 240 feet above ordnance datum, and consist of one reservoir with a capacity of 250,000 gallons, and one containing 600,000 gallons. The St. Leonards Green reservoir is situated about 260 feet above ordnance datum, and has a capacity of 180,000 gallons. Those at Halton consist of two open reservoirs, about 300 feet above ordnance datum, and have each a capacity of 500,000 gallons. These reservoirs will shortly be covered over. The high services, which comprise only a very small area at the east and west end of the district are supplied direct from the pumping stations, the water being pumped through loaded valves at St. Leonards Green, Newgate, and Halton reservoirs.

Attached to each reservoir, except the one at West Hill, are filter beds. These filter beds are built in pairs, one being at rest when the other is being worked; they are built of brickwork laid in Portland cement, and are about five feet deep. On the bottom of the tanks are laid perforated stoneware pipes, which are connected with a main channel constructed of brickwork, through which the filtered water is led to the reservoirs. The filtering mediums, which have a total depth of three feet, are laid over the pipes, and consist of a bottom layer of boulders about one foot in depth. A layer of coarse beach, six inches thick; a layer of medium-sized beach, six inches thick; one of fine beach, and one of sand, each six inches thick. The filter beds are cleansed every week in winter, and in summer time daily; they are in duplicate, and are used alternately. The covered reservoirs are all constructed of brickwork, with a backing of concrete, and in some cases puddle. They are lined for the greater part of their height with Portland cement, rendering an inch in thickness, and are arched over with brickwork in cement, and covered twelve inches deep with soil, and turfed. This arrangement keeps the water perfectly cool, and prevents the vegetation which grows so quickly when the water is exposed to the action of light and air.

The total quantity of water pumped during the year is about 353,000,000 gallons; there results a rate per head on the population of about 18 to 20 gallons for all purposes. This result in regard to the waste of water, as compared with some towns, has been obtained by careful periodical inspections of the house fittings and services.

Hastings is also supplied with a constant service of salt water, and nearly the whole of the streets in the borough are watered with salt water. The pumping machinery at Rock-a-Nore, at the east end of the town, comprises a high pressure horizontal engine of 12-horse power, which drives, by means of spurred gearing, two sets of direct acting pumps and rams. Steam is supplied from two Lancashire boilers, 24 feet in length, each of which is capable of working independently. The water is pumped up to three small reservoirs—one at Rock-a-Nore, consisting of a cast-iron tank, having a capacity of about 20,000 gallons; and two at West Hill, St. Leonards, each having a capacity of about 25,000 gallons. There are only a few of the hotels and private residences which have salt water services, and these are, by degrees, being disused by the consumers, owing to the great cost of keeping the fittings in repair, which are very soon rendered useless and unworkable owing to the corrosive action of the salt.

The water supply to the town is, at present, quite adequate for all requirements, and the water is of good quality. It is desirable that the town should have a constant, and not intermittent, supply; but I think the chances of increasing the supply to any large extent from additional headings or new wells in this district are not to be relied on, in consequence of the numerous faults occurring in the strata, which is not a good water-bearing one. There are numerous instances in Hastings of deep wells and bore holes, which, owing to the faults in the strata, have entirely failed. These wells in some cases, have reached to the lower part of the Fairlight clays, and wells, in which the water had risen at one time almost to the surface, have now failed, which is, no doubt, due to the fact that the strata reached had but a small area of outcrop, and, consequently, can collect but little water; and I believe there are no wells in the Wealden beds which yield a very large supply of water.

It may therefore be said that there is no very great encouragement to sink wells with any idea of getting sufficient water for the requirements of a population such as Hastings will probably contain in ten years' time. I therefore propose to add a few remarks on the future supplies from a distance. The Wealden district is not well suited for large storage reservoirs and gravitation works, because so much of the land is cultivated. Even the highest districts of the central country are now being ploughed, and there no longer remains any extensive areas of waste land; of what does still remain, the larger part is on the north side of the central watershed line, whereas Hastings must get its water from the southern slope. There are some wild upland valleys in Ashdown Forest, in which water of fair quality might be collected, but these run northwards into the Medway. In St. Leonards Forest there is a good deal of woodland and uncultivated land; this drains into the Arun. The best point at which a storage reservoir could best be constructed to collect the water is about forty miles in a direct line from Hastings. The water would have to be brought across the watersheds of the Adur, Ouse, Cuckmere, and Ashburn, but this could be done along the extensive flat occupied by the Weald clay. The engineering difficulties and expenses of carrying water so far, and over watersheds, would, of course, be very considerable; and considering the probability of the water containing a large amount of ferruginous matter, it is not a source which could be recommended. The importance of a soft water is not to be under-rated, and I consider that in any future supply for the town a soft water should be obtained; this can be obtained in almost any quantity from the lower greensand formation. This formation extends along the foot of the South Downs; it dips to the south, and underlies the chalk. It varies considerably in width; between Polegate Station and the river Cuckmere it varies in breadth from half to three-quarters-of-a-mile, and here forms a porous soil. The sand is much coarser in grain than the sands of the Wealden beds, and water will pass far more readily through it. At Glynde the breadth is about two miles in the widest part, and it is in this neighbourhood that I think the best results would be obtained. The strata are here in a basin-like form. The well here would commence near the base of the chalk, and would pass through the upper greensand and gault. Water would probably be found in the upper greensand, and with certainty in the lower greensand. The water from this strata would probably not exceed 8 degrees of hardness, whereas that from the chalk is something like 13½ to 15 degrees, by Clarke's scale. Glynde is 21½ miles distant from Hastings in a direct line; the engineering difficulties in conveying the water would be slight, and the summit levels between Glynde and Hastings are less than 100 feet. No doubt water of a somewhat similar quality could be obtained slightly nearer home, namely, near Berwick, but the probability is that the yield would not be nearly so great as at Glynde. The distance from Hastings to Berwick is 16½ miles. I have not touched upon the sources of supply from the chalk formation; there is little doubt but that a copious supply could be obtained in the neighbourhood of Bishopstone or Jevington, but I am of the opinion that whatever source of supply may be decided upon in the future, preference should be given to a reasonably soft water to that of the hard chalk water.

CIRCULAR WARDS FOR HOSPITALS.

By KEITH D. YOUNG, Esq., F.R.I.B.A.

In the few remarks I have to make on the subject of Circular Wards for Hospitals, I propose to confine myself to some points in regard to which it may fairly be claimed that actual experience has justified theory. The question of the relative value of the circular and rectangular form, has been very fully discussed, but, as yet, it cannot be said to have got entirely beyond the theoretic stage. For, until we are in a position to compare two wards of exactly equal capacity, receiving the same class of patients, and worked by the same Hospital Staff, the one being circular, and the other rectangular in form, we cannot, with any approach to accuracy, estimate comparatively the value of the two systems.

The points which I wish to bring before you are some of those in which the circular system has been assailed, and in which I submit that it has in practice justified itself.

Let me take first the assertion that in a circular ward, the light would not penetrate to a sufficient distance for practical purposes, on account of the necessarily greater distance between the opposite windows. It is, of course, true that the distance in a circular ward of the smallest size, between opposite windows, will be greater than in a rectangular ward of ordinary width, but from the very nature of the circular form, the sum of the light shining in through all the windows, and converging to the centre, must be as great as that which passes through an equal number of windows in the rectangular ward. Where the difference lies, is in the fact that each bed will be further away from the window immediately opposite to it in a circular ward, than would be the case in a rectangular ward. That this circumstance is really of no importance whatever, could very readily be shown by reference to the old form of double wards, still to be seen at Guy's, the London, St. Bartholomew's, and St. Mary's Hospitals, where the central rows of beds are not only some 24 feet distant from the windows opposite, but derive their sole light from those windows, the spiral partition being in some cases a solid wall, in some, a wooden screen. But a better refutation of this criticism is to be found in the fact, that neither at Burnley, nor at Antwerp, nor in your own Hospital, has the slightest inconvenience or difficulty been experienced on this score.

Secondly, it was said that the circular form would present serious difficulties in the way of efficient supervision. This assertion was, to a certain extent, justified by the way in which, at Antwerp and Burnley, the central space in the ward is obstructed by a large nurse's room in the one case, and by a spiral staircase in the other. These obstructions do not exist in the Hastings Hospital, and I believe the staff will bear me out in saying that its wards are as capable of being efficiently supervised, as any rectangular wards in existence. At Burnley, the testimony of the staff is that, but for the central obstruction, the wards would be the perfection of Hospital wards.

It will, I think, be admitted that the centre of a circular ward should be kept as free as possible from obstruction, and that nothing should there be erected except the structure necessary to contain the stoves with their smoke flues and ventilating shafts.

The third point to which I wish to draw attention is one that has been almost wholly ignored by the opponents of the circular system. It is the value of the circular form, in cases where, as in the Hastings Hospital, and at the Miller Hospital, at Greenwich, the site is restricted, or presents difficulties in the way of planning. An illustration drawn from your own Hospital will put this point very clearly before you. Suppose the central block to be exactly the same as it now is, and that it was desired to build two blocks of rectangular wards, of the same capacity as the existing circular wards. You would find that eastwards, the rectangular block would absorb nearly the whole of the adjoining house in White Rock Place, and that westwards, the corresponding block would extend over the greater part of White Rock Road, and that the necessary projections for the lavatories would either have to be built out at the back, and valuable cross ventilation sacrificed, or a further encroachment made at either end for the purpose. Again, at the Miller Hospital, at Greenwich, it was proved to demonstration, that only by the adoption of the circular form was it possible to plan properly lighted and ventilated wards on the site.

One word as to cost. It has been asserted on several occasions, that the cost of building a circular ward is far greater than that of building a rectangular one. That the cost is greater, I am not prepared to deny—but, that it is so enormously disproportionate as some writers would have us believe, is not the case. At the Great Northern Central Hospital we have the means of a very near approximation to a comparative estimate, and the difference is certainly under 2 per cent. For reasons which it is not necessary to discuss, I cannot fix the difference with certainty, but I believe the variation I have mentioned to be very near the truth.

There are now in active operation three general Hospitals with circular wards, in this country: at Greenwich, Hastings, and Burnley, and a large general Hospital is in progress at Liverpool, with wards of both the circular and rectangular form. In London, I hope that at no very distant date the Great Northern Central Hospital will be completed, by the addition of its circular block. At Antwerp, there is the great Civil Hospital with over 300 beds, and eight circular pavilions.

When all these Hospitals are complete, it will be possible to obtain a more accurate idea of the value of the circular form as opposed to the rectangular, than is at the present time available. Meantime, I venture to think that the circular ward has proved itself to be, for all practical purposes, fully equal to the older form, and, under certain circumstances, distinctly its superior.

ON CIRCULAR WARDS
AT THE HASTINGS HOSPITAL,

By FREDERIC BAGSHAWE,
M.A., M.D., Cantab., F.R.C.P.

PHYSICIAN TO THE HOSPITAL.

THE Hastings Hospital has now been in full operation for upwards of a year and a half, and I venture to say that we have every reason to be gratified with our experience of the building as a whole, and of the circular wards in particular.

Under the peculiar conditions of site which our Hospital ground offers, lying, as it does, alongside of a noisy thoroughfare running east and west, long parallelogram wards would naturally have had their walls and windows north and south, and would have had the disadvantages of excessive exposure to the noise of busy traffic, to the heat of the midday sun, both direct, and reflected from the sea in front, and to the force of the sea winds. The circular towers, in which the wards lie, offer but one point of contact at a time to the direct or reflected light, so that external light and heat are more distributed and less excessive than they would otherwise be, and less surface of resistance is offered to the sea gales. The same is true of noise, and it is a matter of frequent remark that our wards are far less noisy than the situation would lead one to expect, and the patients are not at all inconvenienced by it. Something is, no doubt, due to the thickness of the walls, and to the double glazing of the windows.

The aspect of the interior of the wards is cheerful, roomy, and agreeable. Every bed ranged round the circular wall is equidistant from the central fireplaces, thus every patient has his equal share of fire-heat and brightness.

Probably, in the Hastings Hospital, with its 12-bed wards, and with a diameter of about 40 feet, we have the perfection of the size of a circular ward. A convenient space of about 12 feet intervenes between the foot of the bed and the central fireplaces, wherein to arrange table, chairs, and couches for the use of patients who are able to leave their beds. In the smaller wards of the Miller Hospital at Greenwich, with their diameter of 35 feet, the intervening space is such as to give a somewhat cramped feeling to the ward, while in the larger circles at Burnley they have utilised the inner circle round the central staircase for the service of children's cots. The same excessive floor space is seen in the Antwerp Hospital, with its diameter of 60 feet, and its 20 beds ranged round the circumference. The Hastings wards depend entirely for warming upon their three central fire stoves. Each has its air chamber at the back, and when in full work admits of a good current of warm and fresh air into the ward. In cold weather, and when there is a strong breeze, it is requisite to close the inlet on the side facing the wind, otherwise the inflation of cold air is so rapid that it has no time to get heated before it comes into the ward.

The general heating of the ward, even in cold weather, is adequate to the requirements in this climate. Were it not so, it would be easy to place a single coil of hot water pipe round the circumference of the ward.

The temperature of the centre of the ward is often some four degrees warmer than the circumference, even with the inlet apertures under the beds kept closed. It is found by experience that these can seldom be open in winter without causing excessive draught.

The fireplace inlets, together with the discreet opening of the fan-lights at the top of the windows on the lee side of the ward, supply sufficient inlet of fresh air to keep the ward fresh. The extractors near the ceiling, placed in the central shaft above the fireplaces, do their duty well. The ventilation is thus efficiently carried out, and it is seldom that there is any stuffiness in the wards; when there is, it is easily remedied by care and attention to the openings. The working of the wards is exceedingly satisfactory. The nurses find it very convenient and easily managed, and the central chimney stack offers no obstruction of any practical moment, and both patients and nurses prefer the circular to the ordinary form of ward.

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THE

DISPOSAL OF THE DEAD.

By EDWIN HAWARD, M.D., F.R.C.S.I.

THE duty that lies before me in regard to the all important subject about to be brought under discussion this afternoon, is a very simple one. The President of the Congress has informed me that two or more of the most distinguished authorities living have intimated their intention of reading or speaking on this subject, "The Disposal of the Body after Death;" and as they will represent very distinctive, and, in some respects, opposing views, there can be no doubt that this meeting, before it parts, will be in full possession of all the leading and best evidence by, and on which, to come to a sound conclusion. It is my particular function to open the way to discussion—to write, in fact, what may be called a short preface to the volume which is to follow.

About the time when I was commencing my professional career, the subject now before us was occupying the public mind to a degree, of which the present generation can form but a faint idea. The graveyards of London, and many of the provincial cities and towns, had become positively dangerous to the health of the community, and had shocked the moral sense of the people to an extreme degree. Mr., now Sir Edwin Chadwick, had presented to Sir James Graham, then Secretary of State to the Home Department, his very elaborate report or essay on the practice of interment in towns, drawn from a special inquiry into the whole subject, and had condemned in no measured terms the then existing practice of burial. He opposed interment in the vaults of all Churches, and in graveyards surrounded by inhabited houses; he opposed equally the long retention of the dead in crowded rooms before interment, and showed by the most convincing evidence that the system he condemned led to extravagant expenditure for funerals, an expenditure which could not be less than between £6,000 and £7,000, for London, as it then existed, and between £40,000,000 and £50,000,000 for the whole of England. Mr. Chadwick was ably supported by other sanitarians, and especially by Mr. Walker, who, by his labours, obtained the sobriquet of Graveyard Walker, whose statistics of graveyards is quite a curiosity in our natural history.

The results of these enquiries and disclosures, led to a change sufficiently great to modify the appearance of this country; the old graveyards around the Churches remained, but were supplemented by the new and beautiful cemeteries which sprang up in every direction, and gave a new feature to every extensive landscape, and, for the time, this change seemed—in so far as England is concerned—to set the question of the disposal of the body after death entirely at rest.

For thirty years, the newer Cemetery system played its part satisfactorily, but with the advance of time, and increase of population, that too became challenged, and now the controversy is rising fast for further change and further improvement.

I do not think that this controversy is remarkable or uncalled for; the existing cemeteries have, in many instances, completed their careers. In some places they have become so surrounded by human dwellings as to be very little better than the old graveyards on a grander scale, while in many other instances they have become so crowded as to resemble the old graveyards in a still closer degree. If I were to particularize—from what I have seen myself, and heard from others, whose word can be quite relied on—I should almost have to re-open from renewed evidence the disclosures of Walker, which so shocked the consciences of England half a century ago.

We are entering, then, now on what may be called a new revolution of thought and practice, and this, in a much more advanced form than before.

The question sharply put, presses: Shall new Cemeteries be opened on a larger scale, at a greater distance from cities and towns, and with new and better facilities for transit, as per special lines of Railway to and from them, or shall there be introduced a radical reform which shall change the present system of burial *in toto.*

There seems to be a daily increasing opinion on this question, to the effect that a radical change is required, and we have, I take it, met this day to discuss what, in our opinion, that change should be.

It will help us, perhaps, in debate, if for a few moments I touch on the different methods of disposal of the body after death, and by selection of the most feasible methods, reduce the argument to the smallest dimensions.

There are six methods extant.

1.—The first of these is the ancient plan of embalmment, the plan which, in Ancient Egypt, was brought to such perfection that the relics of it remain to this hour, and which, under modern skill, has been so much improved that the ninety days of the Egyptian embalmer have been reduced to ninety minutes. Embalming still has a legitimate place,—as, for example, if it be wished or necessary to preserve the dead for a long time; as for example, for conveyance from one country to another, or for purposes of identification. But, as a process applicable on a universal, or even on a large scale, it must be excluded as too costly in practice, and worse than meaningless in intention; for a country which retained all its dead would soon become a country of the dead rather than of the living.

2.—In some parts of the world—as, for instance, in India, where the Parsee flourishes, the silent gardens, as they are called, are the final home of the dead.

To these gardens the train-bearers carry the dead body with great solemnity, and leave it to the birds of prey. I need not say more on this process; it is obviously excluded.

3.—The third method is that which is common still in our own country, and in most civilized communities, and which consists of enclosing the body in leaden or wooden receptacles, and burying it under the earth, but preserved for a long time from the decomposing influence of the earth. I do not know of anything more inconsistent than this method, it being neither one thing nor the other. It is wanting in the logical acumen of the Egyptian method of embalming, because it does not systematically preserve the body; it is wanting even in the method of the silent garden, because it does not immediately destroy the body, and is altogether wanting in Sanitary wisdom, because it leaves the body in a condition fitted under circumstances constantly recurring, as a possible cause of injury to the health of the living. Nothing but custom, originating from sentiments and superstitions of a dark and ignorant age, could maintain such a system, and in my opinion it ought, like the two previous methods named, to be excluded absolutely from modern civilization and enlightenment.

4.—The late distinguished Physician and Sanitarian, Dr. Parkes, of Netley, proposed as a mode of burial for general use—burial in the deep sea. There is much to be said in favour of this method. For many ages, it has had the sanction of usage, and in the course of the year a large proportion of the dead is committed to the grave of the waters.

In a sanitary point of view, this method may be considered as *perfect*. and it is quite probable that the day may come when it will be largely extended. The difficulties which lie in the way are the distance and inconvenience of transit.

It might be adopted in places situated on, or near the sea coast, but at present it is a method which must be very limited in its application. I would not exclude this mode of burial—and, indeed, could not, because necessity sometimes calls for it—but would leave it where it stands. As the President has said in one of his essays on the subject in hand, we are at this moment driven to deal with Earth to Earth Burial and Cremation, as two, or one of the two, methods that alone remain for consideration. It is true that the use of chemically destructive substances has been suggested, but there is no sufficient reason yet supplied for pressing this suggestion forward. I shall keep, therefore, now to the last two methods, Earth to Earth Burial, and Cremation.

The direct earth to earth system has been strongly advocated in this country by Mr. Seymour Haden, who will advocate it in his own clear and decisive way. What I have to say will therefore be brief. I would not speak of it further were it not within my experience to state that where it is carried out, it is an excellent method; on a large scale it is most effective. In Turkey, and, I believe, wherever the Mahommedan rule prevails, the earth to earth plan is carried out. The dead body is borne on a bier to the place of sepulchre, and, simply covered with a shroud or shawl, is laid directly in the earth. Mr. Haden modifies this plan, and adapts it to the common usage of the country by placing the body in a wicker or basket coffin, so as to leave it really in contact with the earth.

This plan is truly from the "Cradle to the Grave," and it has this great advantage, it introduces no new phase or formula in the act of burial. I observe that amongst those who are attached to the burial service of the Church of England, Mr. Haden's plan is warmly espoused. Thus I find in the substance of a sermon preached in Manchester Cathedral in September last, the Rev. F. Lawrence, Vicar of Westow, and Hon. Secretary of the Church of England Funeral Reform Association, making the following observation: "The Christian is only comparatively beginning to live when that happens to him which is called death. He himself is then gathered to his fathers, into a higher sphere of existence, having no further use for the earthly corruptible body in its present condition. The body will, therefore, be laid into the earth as soon as signs of dissolution begin to appear, and this as completely, as decency and reverence permit, in a coffin such as that suggested by Mr. S. Haden, constructed not with a view to its endurance, but to its perishability, made not of lead, not even of durable wood, but of such materials as shall have all the essentials of a strong coffin and be not remarkable in appearance, yet will yield after interment, and expose the body to the action of the earth and air.

The burial will be, if possible, in earth sufficient and suitable for the resolution of the body into its constituent elements in accordance with sanitary laws which demand that the health of the living be taken into account. Thus buried, the body, which was the tenement of an immortal soul, is consigned to His keeping who secretly fashioned it as it pleased Him, and who will as secretly dissolve it now that it has served its purpose. As the leaf falls upon the ground and is gradually absorbed into the earth, so the human body, if properly buried, is dissolved by natural processes, quietly and gently, and disappears as God provided. And instead of a family vault there will be a family field kept (it may be) as a small garden wherein the dead are buried side by side in the frailest possible casket, the earth being ready, generation by generation, to receive the dead for any time to come.

A cemetery thus used would not be an accumulation of human remains in every stage of arrested and prolonged decay, too vast for earth and air to purify and disintegrate, but a place where the dead, unobstructed by that which retards dissolution, pass away imperceptibly to the harm of none, and leave the earth ready to perform its beneficent action again. Such *will* be the *Campo Santo* to be attached to Westminster Abbey if the earth used be properly prepared and the coffins be perishable.

It is natural and becoming in the bereaved to give expression to their affection by *some* appreciable outlay. The cost of this mode of burial in proper graves need not be much more costly, because, if the coffin be always perishable, the earth will be occupied only during the brief period of dissolution, instead of for *all time*, and be available for continuous use.

These arguments in favour of Earth to Earth Burial are, without doubt, exceedingly strong, and appeal to a vast multitude of minds. New Cemeteries, constructed of proper soils, and properly planted with rapidly growing vegetation, would meet, perhaps, entirely the wants of the community, while it would be in accord with popular sentiment, always an important factor in every great social reform.

I do not for an instant dispute these facts, neither do I wish to conceal that the natural mode of disposing of all dead substances seems to be by the earth—dust we are, and to dust we must return. Moreover, it seems as if in the renewal of existence, the dead material was necessary, or to quote again a passage by the President, "the world of life constructed from a limited supply of matter, rebuilds itself out of the quarry of death."

I trust I have been strictly fair to Earth to Earth burial, because I confess that my own predilections go with the last method to which I shall call your attention, viz., *Cremation*, or, as I should prefer to call it, *Incineration*. On this point we shall have the privilege to hear Sir Spencer Wells and Mr. Hanham, the Honorary Secretary of the Cremation Society. They will tell us all that can be advanced in favour of Cremation, but perhaps they will permit me to indicate what they would rather not say for themselves, viz., that through their exertions, coupled with those of Sir Henry Thompson, whose latest work on the subject, though small, is brimful of information, that a very distinct effect in favour of Cremation is extending through the public mind in this country, and is becoming so much favoured in America, that the best work on the subject has been recently published there by Dr. Hugo Erichsen, of Detroit, with a preface by Sir Spencer Wells.

We may, in fact, look upon Cremation as an accomplished fact making rapid progress. No obstacles of law now impede it, and we find one of the most popular Church of England ministers, the Rev. H. R. Haweis, saying of it in regard to the late cremation of the Marquis of Ely, that the Cremation Society, on 2,000 acres of land equal to the Woking Societies' grounds, could accommodate the ashes of the people of London for 160,000 years.

Public sentiment is turning, then, to Cremation, and may possibly continue to turn with astonishing rapidity. We, as Sanitarians, have to inquire whether there is any Sanitary objection. I could adduce a large number of Sanitary reasons for the process, and I know of only *one* against it, I mean that *first* advanced by Moha, that if the process were universal, the organic world would lose one of its more important constituents—Ammonia. What, it is said, would be the ultimate fate of the living organic world if the whole of the dead organic matter derived from the bodies of the dead were swept at once by intense heat into inorganic compounds, which have no sustaining property for the vegetable kingdom. It has further been argued that to cremate we must employ fire, and so deduct from the finite materials which give forth heat. So it is urged by Cremation, that we burn the candle at both ends, and have no compensation beyond the caprice of fashion that ignores National Capital and defies natural law. Sir H. Thompson meets this objection by the argument, that the ashes of the incinerated dead would fully compensate for the loss above referred to. The point is one that could only be settled by the chemists, and it ought to be settled before incineration becomes general. I offer no opinion upon it; it will receive due attention in the discussion which is to follow. It seems to me to be the one faulty link in the chain of argument for Cremation, and as the strength of a chain lies in each link, so this may be the fatal fault in the argument for Cremation.

In conclusion, and practically, I submit the following three suggestions:—

(a) That the present common mode of burial in strong closed receptacles be at once abolished as false in sentiment and unwholesome in principle.

(b) That all burials for the future should be carried out on the Earth to Earth principle, advocated by Mr. Seymour Haden.

(c) That Cremation, subject to proof that there is no interference to natural law, should be generally recognised and encouraged as one of the most important Sanitary advantages belonging to the present and the future.

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THE

DISPOSAL OF THE DEAD:

A PLEA FOR LEGISLATION.

By FRANCIS SEYMOUR HADEN, F.R.C.S., &c.

As what follows is only a portion of the paper which I communicated to the Congress, and only partly expresses my views, it is necessary I should explain that my object in writing on the subject at all has been not merely to show (which had not been shown before) that what is called the "over-crowding" of cemeteries is unnecessary, but that the remedies proposed for that over-crowding—such as the opening of new cemeteries, cremation, &c. — are equally unnecessary. Fortified by the well-defined cosmical law, which provides for a return to the earth of all organized bodies that have lived and died upon its surface, I therefore pointed out that by enclosing the bodies of the dead in hermetically sealed coffins we were vainly seeking to make them an exception to that law, and by preventing their dissolution were ourselves the cause of their embarrassing accumulation. Further, I showed that by the simple expedient of enclosing them in coffins which would not prevent the resolvent action of the earth—in coffins, that is to say, as perishable as themselves—we had it in our power, at any moment we pleased, if not wholly to undo the mischief we had done, at least to stay its progress and avert its ultimate consequences. Finally, I declared that if the dead were only thus properly buried, in from three to five, or at most seven years from the time of such proper burial, not a single dead body would remain to infect the soil, and a quantity of land of incalculable value, now hopelessly alienated, would be liberated for the purposes of hygiene or of utility.*

But if the strong coffin is the proximate and material cause of the so-called "over-crowding" of our cemeteries—the remote and moral cause is the unreasoning sentiment which prompts us to keep the body unburied till its use becomes a necessity. Yet it is this retention of the dead in the dwelling-house, if only for one day beyond the time prescribed by Nature, which is the head and front of our error, as it is also the cause of all our difficulties; since it is that retention which necessitates the strong coffin, and the strong coffin again which prevents the resolution which it is the office of the earth to accomplish, and which it should be the first care of the living to promote. This is but a simple sequence of simple ideas, and yet I know not how this necessary sequence, simple as it is, is ever to be brought home to, and practically applied by, the common understanding, without the aid of legal prescription. The object of keeping the body unburied, though arising partly, no doubt, from an indisposition not wholly unnatural to part with it, is yet, I imagine, chiefly to gain time to summon friends from a distance to attend it to the grave, and to prepare the customary mourning against the day of the funeral. But are these reasonable objects? The dead body being what it is—what we see it to be by the changes going on in it—can such an indulgence, the terrible cost considered, be reasonably defended? Frankly, I think not.

And here, it occurs to me, that I may perhaps disarm the prejudice which shrinks from exposing the bodies of the dead to an actual contact with the earth if I describe in popular terms what that friendly contact means. Some curiously mistaken notions exist as to what happens to a dead body when, in the words of the old ritual, it "is laid into the ground," the common notion being that it becomes a part of that clay to which it is committed. Nothing of the kind, of course, is the case. A body properly buried—buried, that is to say, in such a way that the earth may have access to it, does not even remain in the earth, but returns to the atmosphere. Let me explain. Suppose a body buried three or four feet below the surface ; the earth, as earth, affects it in no way whatever. The part played by the earth in its resolution is that of a mere porous medium between it and the air which is above it. Through this medium, the air, with its dews and its rains, filters, and when it reaches the body, in chymical language, oxidizes it, that is to say, resolves it into new and harmless products ; and then these new products, passing upwards again through the same sieve-like medium, re-enter the atmosphere and become the elements of its renewal, and of the nourishment and growth of plants. The body, in fact, literally as well as figuratively, ascends from the dead, and fulfils the cycle of its pilgrimage by becoming again the source and renewal of life. Is it possible to conceive a provision more beautiful, more benign, more suggestive, not of gloomy, but of elevated and consoling trains of thought? And yet it is this very provision which, with our strong imperishable coffins, we are doing our best to prevent, and which the apostles of cremation would have us believe they can improve upon! Another mistake, too, is to suppose that, after a time, the coffin itself decays in the earth. It does not. Substances only which contain nitrogen decay in the earth, decay being, to use a familiar figure, the effort of the nitrogen to get out. But wood is a non-nitrogenous body, and does not decay ; so that, in the Holborn burial ground, the coffins of Charles II.'s time were found just as they were buried, and with their contents just as putrid, while the surface had been raised no less than eighteen feet by this mass of boxed-up putridity. That is what we are doing with our strong and costly coffins—dishonouring the dead, poisoning the living, and abusing the great gift of that friendly earth which lies at our feet only ready to serve us.*

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* Haden, Francis Seymour, F.R.C.S. Three letters to the *Times*, January 12th, March 13th, and June 16th, 1875. Reprinted by Macmillan.

I regret to have to add anything to this paper by a further reference to cremation. I shall say little about it. I have elsewhere shown that in the case of proper burial it is uncalled for, and in the case of improper burial, at best but the substitution of one evil for another. I shall be much surprised if I am not also able to prove that it is dangerous, and, being dangerous, that it is, fortunately, on anything like an extended scale, impracticable. I will say nothing of the objection to the burning of the body, as a *rite*, which, however, I apprehend will always be felt by the majority of persons in this country. That it can be intended by its promoters to take the place of, or even to make any appreciable impression upon the larger national custom of burial (divested, of course, of the abuses which disfigure it), I can scarcely believe. In fact, I do not believe it. Nor do I suppose do they. It is useless, therefore, to speculate as to the precise objects of their agitation.

To take cremation first on its impracticable side. It is all very well to achieve the burning (with an occasional failure) of a single dead body, or even of half a dozen, and to put a record of the achievement into the newspapers; but quite another thing to deal with the mass of animal matter represented by the 2,000 deaths which occur weekly in greater London alone. Do the members of "The Cremation Society of England"—for with such a title they must contemplate operations on a large scale—believe in the possibility of their ever being able to cope with such a mass? Have they ever calculated the time necessary for such an undertaking, including the performance of the *post-mortem* examination of each body they burn, which for reasons to be presently noticed, they have found it necessary to promise; ever considered the magnitude and extent of the apparatus necessary to drive into vapour a vast recalcitrant residuum of this sort; ever counted the cos of it; ever proved the effect of such a proceeding on the respirable air around? Let those who know what it is to live in the neighbourhood of a single bone boiling, glue making, soap manufacturing establishment, or of a pottery, or within half-a-mile of a brickfield, or even to windward of one of those comparatively innocent *vomitoria* engaged in the dispersion of the calcined vegetable refuse of Covent Garden Market—answer; and then contemplate the perfect ease with which Nature effects her sublimation of the same thing, or any amount of the same thing—and does it, too, not to our hurt, but our benefit!

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* Xenophon Cyropœdia.

Then, to take cremation on its philosophical side. What are we to think of its boast that it is able, as an improvement on Nature's method, to do in two hours that which she, Nature, takes three years to do; or of the assurance that cremation and burial are "the same thing," and that they "come to the same thing"? Surely, not only are they not the same thing, but they never come to the same thing. Nature in all she does proceeds slowly, and by measured steps, each step depending for its perfection on the perfection of the step that immediately preceded it. Every day we are witnesses of the constancy of this law. We see it in the growth of plants, the succession of the seasons, the alternations of heat and cold, of drought and moisture; in the progress of the child to manhood, the fusion of manhood into age, the refuge of age in the grave. And not even there does this wonderful continuity end. By the slow disintegration which goes on there, and by the products which are returned by the buried body to the atmosphere —and let the cremationist observe they are so returned only in the exact proportions in which they are needed —plants are nourished, animal life is renewed, and the atmosphere itself is replenished and purified. Does cremation do the same thing or anything like the same thing? Would it be the same thing—for what is true of part is true of the whole—if the rainfall, say, of three years came down upon us in three hours! The statement is inexact and unscientific, and there I leave it.

Again, in their arguments against burial as a principle, it is noticeable that the advocates of cremation deal largely in "germs" and other matters equally occult and speculative, and, by a pretty free use of Pasteur's term especially, seek to shake our faith in the plan pursued by Nature for the resolution of dead matter since the beginning of the world. Well, all I can say to that is, that, without being in a position either to affirm or to deny the existence of these hostile germs and the harm they do, I should like to hear from the cremationists something of the friendly germs and the good they do. If it should come to be proved, which is possible, that the great operations of Nature, destructive as well as constructive, are carried on chiefly by germs, all I can say is that I am prepared to think as highly of germs as I do of chymical action or of any other of those forces, physical or vital, by which Nature is pleased to work. I object, however, to their employment as missiles, and to their being held up at us as bugaboos.*

More seriously. To take cremation on its dangerous side; its advocates, strange to say, encouraged by a mere failure of jurisdiction in the prosecution of a recent case, make much of the law and assume it to be in their favour, whereas the judgment of Sir James Stephen amounts to no more than this, that cremation is only not illegal, because the law, having had no reason to contemplate its revival, has made no provision against it. In the same way it has made no provision against cannibalism, and, till lately, had made none against the unforeseen use of explosives. Such a judgment, therefore, ought no more to be regarded as an encouragement to cremation than as an expression of the insufficiency of the law to prevent it. Nor, one would have thought, is the revolting incident on which that judgment is founded — the finding of a crazy old man at the top of a mountain trying to burn his child in a barrel and threatening to do "the same to his bull Morgan"—an incident of a nature to commend itself to anybody.

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* In reply to the wild statements of the Cremation Society as to the mischief done by germs, and of the powerlessness of the earth to counteract that mischief—such as the re-appearance upon the surface of infectious disease after long periods of burial—the Duke of Westminster has well observed that in Cheshire, where thousands of cattle affected with pleuro-pneumonia and rinderpest—the most infectious of infectious diseases—were buried, there has been no re-appearance whatever of that disease, though their burial had been in many cases hasty and in all cases superficial.

Be this, however, as it may, as a commentary on the little value to the cremationist of such a judgment, the practical fact remains that the medico-legal objections to cremation, since it would facilitate all those forms of secret murder, the evidence of which is *only to be found in the body of the victim*, are insuperable. To be convinced of this we have only to consider the circumstances which usually surround one of the commonest of those forms—murder by poison; the variety, the subtlety, often the novelty, of the poisonous agent; the extreme improbability that the surgeon called in—if he be called in—has ever seen its effect either on man or on animals; the care now taken by a class of well-meaning but mischievous enthusiasts that he shall not see it; the symptoms of the dying state which are common to death by poison and to death from disease; the advantage of preparation on the side of the poisoner; and, finally, the fact that discovery when made is generally made at some *variable period after death*, and then rather in consequence of an aggregation of suspicious collateral circumstances pointing to the commission of other crimes of a like nature, than of any possible observations at the bedside of the murdered person. To meet this array of formidable difficulties, the Cremation Society contents itself with offering to make and hopes to satisfy the public by making a *post-mortem* examination of every body they burn. But of what use can such an examination (which must be perfunctory since it is to be made in *every* case) possibly be? A moment's consideration is sufficient to demonstrate its worthlessness. In many, if not in most cases of systematic poisoning, the poisonous agent is to be looked for, not in the stomach or intestines (as a cursory examination supposes), but in organs remote from the digestive track, and is at last only to be discovered in them by processes which necessitate not hours, but days and weeks in their application—by a destructive analysis, in short, of every absorbent organ of the body. Are the Cremation Society really prepared to embark in such an analysis? Are they quite sure that in this they are not counting rather too much on public ignorance? But even supposing them to be in earnest, would that section of the public now so anxious to be cremated and to cremate their wives and daughters, be able to look with equanimity on the necessary conditions precedent to such a proceeding—conditions which may be hinted at, but not described? Are they even prepared to submit to a *post-mortem* examination at the hands of strangers at all?

I have only to add that, roughly summarised, this paper and all I have written on the subject will be found to be embodied in the following six propositions, namely:—

(1) That the natural destination of all organised bodies that have lived, and that die on the earth's surface, is the earth.

(2) That the evils which the cremationists would have us believe to be inseparable from the principle of interment are independent of that principle and of our own creation.

(3) That the source of these evils is to be found, not in the burial of the dead, but in the unreasoning sentiment which prompts us to keep them unburied as long as possible, and then to bury them in such a way that the earth can have no access to them.

(4) That the principle of burial supposes the resolution of the body by the agency of the earth to which we commit it, and that the earth is competent to effect that resolution, and to effect it innocuously.

(5) That to seek to prevent the beneficent agency of the earth by inclosing the dead in imperishable coffins, brick graves, and vaults, is in the highest degree irrational, since it engages us in a vain resistance to an inevitable dispensation, and has led us to accumulate in our midst a vast store of human remains in every stage and condition of decay.

(6) That the remedy for such evils is not in cremation, but in a sensible recognition of, and a timely submission to, a well-defined law of Nature, and in legislative action to enforce the provisions of that law.

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PROGRESS OF CREMATION IN ENGLAND.

By SIR T. SPENCER WELLS, Bart., F.R.C.S.

TWENTY minutes have been allotted to me in order that I may ask for your attention to that mode of disposal of the dead known as Cremation; and I do not propose to spend many of these precious minutes in refuting objections, religious or sentimental, legal or medico-legal, which have been made to this alteration in the long-established custom of burial in the earth; nor in proving that burial of the entire dead body—either in vaults or graves, in coffins, or after the simpler method advocated so ably and earnestly by my old friend, Mr. Seymour Haden—is the worst of the many modes of disposal of the dead. Cremationists assert that earth burial is, and must be, injurious to the health of the survivors. I take this as proved—certain, undeniable—becoming every day, as population increases, more and more dangerous to the public health; and I will confine myself to the attempt to inform you how anyone who wishes to dispose of his own body, or of the bodies of friends or relatives after their death, may do so without any risk of injuring others; and may do it easily, reverently, and economically. All this the Cremation Society of England enables any one to do now, and will, in a very short time, do it still better, and at a smaller expense.

That you may place confidence in the promises of this Society, let me first say that it is not a commercial association—not, like a Cemetery Company, paying a dividend to its shareholders, upon its profits—but a purely scientific society, established to reform the present mode of disposal of the dead, and to promote the objects set forth in this Declaration: "We disapprove the present custom of burying the dead, and desire to substitute some mode which shall rapidly resolve the body into its component elements by a process which cannot offend the living, and shall render the remains absolutely innocuous. Until some better method is devised, we desire to adopt that usually known as Cremation."

The Conditions of Membership are very simple. First, adhesion by signature to this declaration; and secondly, the payment of an annual subscription of one guinea, or a life subscription of ten guineas.

The Governing body, or Council of the Society, is elected annually. The present members are the President, Sir Henry Thompson, to whose writings and influence the rise and progress of modern Cremation is more indebted than to any other man in this or any other country. Then (naming the Council in alphabetical order), we have the venerable Lord Bramwell, now as distinguished a member of the House of Lords as he formerly was at the Bar and on the Bench. Mr. Budgett, a landowner and magistrate, who resides near Woking, Treasurer of the County Hospital, takes much interest in the improvement of the Crematory Buildings and Grounds. Dr. Cameron, who represents Glasgow in the House of Commons, who induced 79 of his colleagues in the House to vote in favour of a Bill for the better registration of the causes of death, and which would have removed some doubt felt at the time, but since dispelled, as to the legality of Cremation, and who has this session given notice of a somewhat similar measure. His masterly article on "The Modern Cremation Movement," is here on the table, and is well deserving of careful study. Next comes a lady, well known as an enlightened philanthropist and philogynist—if such a word can be wanted by anyone, or if anyone can suppose that the love of man does not include the love of woman —Mrs. Rose Crawshay, a liberal benefactress, not of her own sex only, but of mankind in its widest sense. Next comes another Scotch Member of Parliament, Dr. Farquharson, the able and active member for Aberdeenshire. Then we have Sir Douglas Galton, representing not only the Army and the Royal Engineers, in which he has long served with great distinction, but the Civil Service of the Government, and the Sanitary Institute of Great Britain, of which he is the respected President. Then we have a well-known member of my own profession, Mr. Ernest Hart, who has done good service to the State, in organising an attempt to abate the smoke nuisance and to prevent the adulteration of food, in the support of the National Health Society, in the establishment of Coffee Taverns, and in efforts to improve the education and add to the sources of rational recreation for the people. Next come two clergymen, Mr. Haweis and Mr. Brooke Lambert, who have been with us from the first, and by their writings and preaching have taught that it is not from the Clergy of the Church of England that sanitary reformers need fear opposition. Then we have a man of science, formerly a Professor of Chemistry, a Member of the late Government, still a leader of his party in the House of Commons, but always listened to with respect by both parties, whose latest work on "Subjects of Social Welfare," adds to the high reputation he has obtained and so well deserved—I need hardly name, Sir Lyon Playfair. Mr. Robinson, whose beautiful work, "God's Acre Beautiful," and his more recent work, "Cremation and Urn Burial," have made his name almost as well known as a Sanitarian, as his works on "Gardening" have led to acknowledged eminence in all that relates to the beauty of our public parks and open spaces, and to the improvement of horticulture and floriculture, in this country. To prove that not only Law and Divinity, Medicine and the Army, Science and Literature, are well represented on our Council, we have Trade and Commerce represented by one of the most esteemed of our London Bankers, Martin Ridley Smith. And just before my own name is that of a religious teacher, formerly in the Church of England, but now a Nonconformist, Mr. Voysey. Our Honorary Secretary, Mr. Hanham, I am glad to see present this afternoon; and I am sure he will be as willing as he is able to answer any questions about the Society which may be asked of him.

Am I not justified in asking whether a Society so constituted and so governed is likely to go very far wrong, or to lead its followers away from the path of true progress? It may be said that it has been at work for fifteen years, and has so far accomplished but little. I ask—Is it indeed little to have overcome much prejudice, doubt, and fear; to have defeated the opposition of two Governments; to have answered satisfactorily the objections of the clergy, the lawyers, and the chemists; to have so far conquered the force of old-established custom or fashion as to have already reduced to harmless ashes the bodies of sixty of our deceased countrymen? Not twenty years ago, the story of the Cremation of an English lady in Germany, although in compliance with her own desire, was received here with a general feeling of surprise and horror. Last month the Cremation of an English Marquis at Woking was heard of without surprise, and the only question raised by the Bishop of the Diocese and the Rector of the Parish, was whether the funeral service of the Church should be read before or after the body had been reduced to ashes. In some cases, the ashes have been taken from Woking to the parish of the deceased, and buried in the churchyard with the usual solemnity. In other cases they have been buried at Woking. In some, they are preserved by relatives. The Duke of Bedford has decided that, after his own death and cremation, the ashes shall be taken in an urn and coffin to the family burial place at Woburn Abbey. And you will observe that in whatever manner the ashes are disposed of, whether in town or country—in, or beneath, or around city churches, or in the graveyards around churches, or in suburban or country cemeteries, or in the private grounds or gardens of landowners—they are absolutely harmless; they cannot possibly do any harm to anything or anybody; they cannot poison air, or water; and the purifying fire which has reduced the dead bodies to ashes, has destroyed the germs of any contagious or infective disease they may contain. Surely this system of Cremation of the body, and burial of the ashes, must be far better from the sanitary standpoint than even the best, simplest, and most perfect system of burial of a mass of corruptible material in the earth. Very few people know, or can imagine, the shocking process which goes on year after year a few feet only beneath the surface of our graveyards and cemeteries. Sir Lyon Playfair says: "I have officially inspected several churchyards, and made reports on their state, which even to re-read, makes me shudder." He also says: "Whether decay or fire destroys corpses matters not to the dead, but it matters exceedingly to the living;" and he goes on to show that even when burial is performed in a perishable coffin, in a dry and porous soil, and the graves are not too crowded, "the dead are resolved into air and ashes as certainly in *three years* as they are in a furnace in the course of an hour;" but, he adds: "How rarely are these conditions fulfilled in our mode of sepulture! We often find in cemeteries that twenty years are not sufficient to effect the change." And he sums up his reflections in these words: "The grave cannot be looked upon with the eye of knowledge except as an evil to the living and a dishonour to the dead."

Very few people seem to be aware that it is now very easy to ensure the Cremation of a dead body, provided satisfactory proof can be given that death has been produced by some natural cause. I have here a form of declaration which has been prepared to enable those who prefer Cremation to Burial to record in precise terms their wishes and directions in relation thereto.

The Form should be signed, dated, and witnessed in duplicate. One copy should be deposited with the will, or with the signer's executor, or next of kin, and the other sent to the Honorary Secretary of the Cremation Society of England, 8 New Cavendish Street, London, W., by whom it will be preserved and regarded as confidential.

"I hereby express to my survivors my earnest desires that, on my decease, my body shall be Cremated according to the system employed by the Cremation Society of England, and under the arrangements made by the Society for the purpose.

Signature ____________________
Address ____________________
Date ____________________

Witnessed by

____________________ Signature
____________________ Address
____________________ Date"

In any case where no such document has been signed, but the Cremation of a deceased person is desired, all the necessary forms may be obtained at the offices of the Cremation Society, and the cost of the funeral, conducted by any respectable undertaker, will be much less than that of ordinary burial, where a grave must be purchased or opened, and a more or less expensive coffin or basket must be paid for. So long as bodies are conveyed to Woking, there will be unnecessary expense in transport; but as the revived practice spreads, and Crematoria are erected in a number of districts or parishes, or in cemeteries where the choice of burial in the earth or of cremation may be left open, the expense of Cremation will be very small, and the economy of the process affords another example of the truth of the wise saying for which we are indebted to our President, Dr. Richardson—"National Health is National Wealth."

The time allotted to me has so nearly expired that I cannot now do more than refer all those who desire more information on this subject to the small book just published by Sir H. Thompson, entitled, "Modern Cremation; its History and Practice, with information relating to the recently improved arrangements made by the Cremation Society of England;" and to another very cheap book, very well illustrated, by Mr. Robinson, now in the press, and about to be published by Cassell and Co., entitled, "Cremation and Urn Burial, or the Cemeteries of the Future." In these two books I believe the reader will find a great deal of information which is very important and thoroughly trustworthy. Both contain extracts from an address delivered ten years ago by Dr. Fraser, the late Bishop of Manchester, at the opening of the Social Science Congress in that city. Coming from such a man, and from a Bishop of the Church of England, it has had immense influence for good, and I will read now a report of some of his remarks. I trust they will again be widely spread by the Press, as the thoughts of a wise and good man, who, "being dead yet speaketh." The Bishop said:—

"I now draw attention to the provision made in our cities for the interment of the dead. On Friday last I consecrated a portion of a new cemetery, provided by the Corporation on the south side of Manchester, fully five miles from the centre of the city, containing 97 acres, at a cost, including the land, the fencing, the laying out, and the inevitable three or four chapels, of £100,000. It is very beautiful; but two thoughts occurred to me as I was consecrating the portion of it assigned to those who desire to be buried according to the rites of the Church of England. In the first place, this is a long distance for the poor to bring their dead; in the second place, here is another hundred acres of land withdrawn from the food-producing area of the country for ever. I do not think we always observe or calculate how much this area is being gradually contracted by the infinite number of works and processes requiring space, but not producing food, which are encroaching upon it more and more every year; nor to what extent the power of the country to support its population is reduced thereby. '*Jam pauca aratro jugera regiae Moles relinquent.*' In times of peace and plenty we can afford to be indifferent to this consideration but I can easily conceive the existence of circumstances which would make this a very serious condition indeed. I feel convinced that before long we shall have to face this problem—'How to bury our dead out of our sight'—more practically and more seriously than we have hitherto done. In the same sense in which the 'Sabbath was made for man, not man for the Sabbath,' I hold that the earth was made not for the dead, but for the living. No intelligent faith can suppose that any Christian doctrine is affected by the manner in which, or the time in which this mortal body of ours crumbles into dust and sees corruption. I admit that my instincts and sentiments—the result, however, probably of associations more than of anything else—are somewhat revolted by the idea of Cremation. But they are, perhaps, illogical, and unreasonable sentiments. Sir Henry Thompson has stated the case in a calm and thoughtful paper, which shows how little ground there is for the somewhat morbid sentiments that, indeed, prevail in relation to the whole subject of the interment of the dead. All I call attention to is, that it is a subject that will have to be seriously considered before long. Cemeteries are becoming not only a difficulty, an expense, and an inconvenience, but an actual danger."

You cannot need my assurance that if the Bishop was right ten years ago, his fear of the cemeteries becoming an actual danger to the public health is every year proving more and more manifest. The "Church of England Burial, Funeral, and Mourning Reform Association" has done a great public service by so repeatedly and powerfully impressing a sense of this danger upon the Government that an official inquiry has at last been ordered into the condition of the London Cemeteries. There are many of our large towns where inquiry is at least equally necessary. In some, as at Leicester, the necessity has been felt and acknowledged, and has led to steps towards the erection and maintenance of a Crematory.

But, while a Government Commissioner is investigating and reporting; while Cemetery Companies are being shamed by exposure into a tardy obedience to scientific denunciation and popular indignation, without waiting for Parliamentary or municipal action, we may at least determine that, as members of a Health Congress, we will not be content with meeting a great evil by any feeble remedy, but will endeavour to avert impending danger by the timely adoption of a simple, economical, but efficient safeguard.

DISCUSSION.

Sir Edwin Chadwick said that some time ago he and several other gentlemen had gone into the matter, and had arrived at the conclusion that burial in open coffins was as effectual, and could be carried out as cheaply as cremation. He suggested that it would be advisable to reprint the reports made by the Commission he referred to.

The Rev. Frederick Lawrence, Hon. Secretary of the Burial Reformation Society, brought before the meeting the fact that it was not literally the person who was cremated or buried. He then read a letter which was to be presented at the Mansion House, in which statements were made as to the awful state of many cemeteries under the present system of burial, proving that the burial of the dead in closed coffins was seriously and increasingly injurious to the public health. The Burial Reformation Society proposed bringing the matter forward at the Mansion House on the morrow. He then gave the lines in which they desired legislation to be conducted, and said that on religious, sanitary, and economical grounds, it was desirable that burials should be on the earth-to-earth system. Finally, he was pleased to inform them that their fee was not 10s. 6d., as Sir Spencer Wells had said the subscription to the Cremation Society was, but only 2s. 6d.

Mr. Hanham, Hon. Secretary of the Cremation Society, said that one of their ideas as Cremationists was to economise the land, and they felt they were not justified in taking for the dead land which could be used for the benefit of the living. If they buried dead in the earth without coffins, they would hurry decomposition to such an extent as to make it intolerable. It was rather unfair to tax them with their present fee, as they were only really in their infancy. He further stated that furnaces could be easily erected in connection with churches, and burial by this means carried out at a much lower charge than under the earth-to-earth system.

Dr. Richardson said they were driven to these two points: Cremation, or Earth-to-Earth Burial. For some time he had been opposed to cremation from a medico-legal point of view, especially upon the grounds of secret murder. He thought now, however, the system had been improved so as to entirely prevent that. He quite agreed with Dr. Haward that there was the one question as to whether it would interfere with natural law, and he thought that Cremationists ought to settle that point. That was the only point of a scientific nature that stood against cremation, and it must be settled. As regards earth-to-earth burial, he himself could construct a cemetery in which the vegetation would be so rapid as to entirely counteract the evils mentioned. He thought in large towns it was almost impossible to do without cremation. For his own part, there was no mode he should prefer to having his poor body cremated. As they, as sanitarians, had not opposed "earth-to earth" burial, so they should not oppose cremation; the great thing was to alter the present abominable system, and then leave it to persons to choose for themselves "earth-to-earth," or "ashes-to-ashes."

Dr. Pietra Santa also took part in the discussion, addressing his audience in the French language.

THE PREVENTIVE SIDE OF MEDICINE,

By FREDERIC BAGSHAWE, M.A., M.D., Cantab., F.R.C.P.,

PRESIDENT OF THE SECTION.

In treating of the great question of Sanitation, we may consider health either as it affects the individual or society as a whole. The former more particularly concerns the medical man; the latter the public guardians of health, whether medical or non-medical. It is of the first—namely, of personal or family health—that I propose specially, though not exclusively, to speak in this present paper.

It is clear that the improved health of the units of society must have a marked effect on the whole sum; but it is also clear that unless the total sum be properly controlled and guided, the units, that is, the individuals must suffer, despite the utmost care these may exercise. For an individual may put himself, his family, and his dwelling into the fittest possible condition to defy disease, and yet suffer from the careless or improper sanitary supervision of the town or district in which he lives. Two measures, then, are necessary that the health of a country may be duly provided for:—1st—That the individual citizen should adopt every known means to ensure his own health, and the health of his family. Secondly—That the ruling authorities should make use of every means that science affords to prevent the outbreak of sickness. Could these measures be effected, disease—that hydra whose poison-toothed heads have been multiplying and extending in all directions since the birth of civilization—would have found its Hercules to fire the decapitated stump of evil, and at last reduce the monster to dimensions as small as contained him in early times. For as the growth of society, so has been the growth of disease; and meanwhile medicine slept, only waking up at such times as the new poison heads came forth, and seldom or never using the sword to cut off the deadly offspring.

Now it has awakened to its most important duty—*Prevention.* Already sickness is reduced; some of its worst forms are almost extinct, and the conflict with others is seen to be hopeful. Along the wide array which the host of sickness displays, some companies have been surrounded and cut to pieces, others are wavering to flight, and the rest, perhaps, if strongly attacked by a concentrated force, would give up the victory which they now seem to claim. Preventive medicine would then be left a victor with no more fields to win, an achievement which would indeed be a noble one.

Be that as it may, I take it to be our duty—the highest because the most useful and practical of our duties—to make the welfare and necessities of man harmonize, to preserve the graces of civilization, while we purge the perils—in a word, to render civilization harmless.

So long as the life of man, his manner of subsistence, clothing, and habitation, was in a great measure similar to that of the quadrupeds round him; so long as he was savage, disunited, a wanderer, simple in all his wants and habits, I do not suppose he knew much of fevers or consumption, or many other ailments that weaken and destroy life. He may have sometimes stood in need of the surgeon, but not often of the physician. With his inborn tendency to gregariousness, resulting in the growth of village, town, and great city existence, arose new troubles to health, and the necessity first for *curative* medicine, which was doubtless soon recognised;

Still later for *preventive* medicine, which has only been fully acknowledged at this late stage of the world's course, and when misery and suffering have taught their lesson.

Though we have risen so late, how wide awake we have become during the last half century, more particularly during the last quarter of it, may be seen from many statistical figures. As Dr. George Wilson says in his excellent work, "Healthy Life and Healthy Dwellings," we have now the power of reducing the sickness and death-rate in most old cities at least one-third. To take the death-rate of our greatest city, London. It was 80 per 1,000 in the seventeenth century, 50 per 1,000 in the eighteenth, and is reduced to 19 per thousand at the present day. Other towns show a similar influence. From 1841 to 1887, the death-rate of Salisbury was reduced from 28 to 15 per thousand; that of Coventry, from 27 to 18; that of Hull, from 31 to 20; that of Wolverhampton, from 27 to 22; while that of our own town is now 13 per 1,000. The improvements already achieved are, however, small indeed compared to what might be done if a thorough system of sanitation were enforced by Government, and carried out without favour to individuals and under really efficient officers. Whether this will ever be done in a country which resists the wisest measures for its own health and safety on the shallow ground of sentiment, or the equally shallow one of "liberty of the subject," is rather doubtful; but it might be thought that sentiment was not worth much when linked with loathsome disease, or liberty of much value to a dead or disabled subject.

But my object is to address myself to a more definite issue, and I propose first to touch briefly on the question of individual health, which is included in, and to some extent is identical with, family health.

This branch of our subject more especially concerns the ordinary practitioner, and how far disease can be prevented by attention to individual health, and the healthy surroundings of the individual, is—or should be—the first care of every physician. Too much stress cannot be laid on the proper training of man for the race of life; and the problem involves two great divisions—care for the individual himself, and for the house he lives in. Neither is sufficient alone; together they are complete, always supposing that the condition of the surrounding district does not interfere to spoil the work. First, then, as to the individual himself. The necessities for health may roughly be summed up in diet, clothing, bathing, and exercise, voluntary abstinence from vicious causes of harm to health being of course understood. Each of these themes would take up too much time to more than briefly consider here, but they are all important factors in the individual health.

Simple and regular diet cannot be too strongly preached. Rich food and irregular meals, together with too little bodily, and too much brain exercise, have produced that potent disorder so peculiar to the present day and present life, which we can find no better name for than "nervous dyspepsia," for it is the result of a chronic disability of the digestive organs begot by an enfeebled nervous system.

Fortunately, we in England are an active race, and love to spend our energies in sport, and the increasing tendency to athletic pursuits helps to counteract that towards nervous and digestive disorders, themselves the result of sedentary habits. The athletic tendency of the race, though it may be harmful to certain individuals, and although it may be carried to extremes, is of undoubted national good both morally and physically. At the same time, from a physician's point of view, exercise should be adapted to the special capacity and need of the individual, as also to the age and sex. It would be superfluous to enter into detail as to the various modes of such exercise.

Clothing in this climate resolves itself into the choice of wool; for woollen under-clothing is most important. It has, indeed, always been advocated by the profession, but has lately been forced on the public notice by the German, Dr. Jäger, who—commercial objects apart—has undoubtedly done much good, both by popularizing woollen clothes, and by providing such fine woollen materials as can be borne by the most sensitive skin. There can be no question that the wearing of pure woollen clothes in place of linen is the best of all preservatives from cold, with all its harmful and fatal consequences.

Those who are prone to chest or throat attacks would do well to divest themselves of linen or cotton, and to wear nothing but wool. Bathing, again, is a valuable aid to health. What is called the "morning tub," cold or tepid, according to season and individual power of reaction, is a most useful tonic. The Turkish Bath is also of high value, and, besides its soothing influence on brain and body, makes the skin do duty for the jaded liver and kidneys, and so relieves those organs.

With proper attention to diet, clothing, bathing, and exercise, a man should win half the battle for health; but then comes the other half of the problem—the house he lives in and its surroundings.

These mainly comprise soil, air, water, ventilation, and drainage. The first three of these are not always within our power to choose. Every one cannot live in Hastings, or Torquay, or Tunbridge Wells, or Malvern, on the hill in preference to the plain, or on a gravel soil instead of a clay one. Nor can every man live where water springs from the granite or the green sand, and not from the limestone or surface beds. But if he has only partial control over these conditions, he has a good deal over the last two. He has also some power over the others. By having his water supply analysed, he can at least make sure that he and his family are not drinking what is virulently injurious to health; and if he is building his house, he can, to a great extent, neutralize the natural damp of the soil by air-courses, drainage, and concrete beddings. Ventilation of the rooms we live in is all-important to health. Where it can be afforded, perhaps nothing is better than Tobin's shafts, which ensure a free supply of fresh air without injurious draughts. At any rate, it is in every person's power to see that his chimney—the one ventilator in almost all rooms—is not stopped up by a register or other hindrances to the free passage of air.

Drainage, the most important of all, should be our first care, both before choosing a house, and after settling in it. An efficient system of drain-pipes and drain ventilation, with periodic inspection by a Sanitary expert, would ensure the prevention of much disease. With the poor the question is more difficult of solution. They cannot afford the refined minutiæ of sanitation, but with increased education and knowledge of the common laws of health, attention to the inexpensive sanitary fundamentals of temperance, cleanliness, and ordinary ventilation, may be expected of them.

And here we come to that great question of the day, which has already made its mark on our generation—the prevention of disease. Our present knowledge is almost sufficient to stamp out many of the worst forms of disease, and what might be done cannot be better shown than by looking at what has been already achieved. A few examples will suffice. Every one knows how, in the 18th century, the terrible state of the gaols, and the accompanying ravages of "gaol fever" were put an end to by the labours of John Howard and others after him. Now, our prisons, instead of being pest-houses, are mostly models of health, so that, as Dr. Richardson humorously observed in his address to the "Brighton Congress," the Judge who formerly had a bunch of rue before him as a disinfectant, is now probably not quite so safe as the prisoner he is trying.

Small pox is another instance. Jenner introduced vaccination in 1796, but this great preventive agent only became general in 1819, and was not made compulsory till 1853. Nothing can be more impressive than the tables which show the proportion of deaths from this terrible scourge to those from all other causes.

In the first seven decades of the present century, out of each thousand deaths, small pox claimed respectively 64, 42, 32, 23, 16, 11, 11.

As in the extinction of Gaol Fever, we saw the result of attention to the simple laws of cleanliness and ventilation: so in the diminishing of small pox do we see the value, not only of taking advantage of a specific scientific discovery, but also of enforcing it. Long may this beneficent Act continue in operation. Again, in typhoid fever, one example out of hundreds will show what care might do in preventing that dangerous and needlessly common disease. At the Bolton Congress, Mr. Railston Brown mentioned the instance of Bridlington Quay, where 80 cases of typhoid fever occurred, and where there was the conjunction of bad drainage and shallow 10ft. wells. For three months, after water was obtained from deep 76ft. wells sunk in the chalk, there were no cases of typhoid. My friend Mr. Gabb bears similar testimony with regard to Hastings. He remarks that in 1857, we had a very dry spring and summer, and then occurred a most serious epidemic of typhoid. This was in the days of cesspools, before the main drainage scheme had been carried out, or an efficient supply of water provided. In some streets of the Old Town not many houses escaped without one or more of their inhabitants being stricken. "I had," he says, "on my list at once 37 cases in various stages of the complaint. Soon after this the drainage was carried out, and was, I believe, completed in the following year. Then a wonderful improvement took place in the sanitary condition of the borough, and typhoid greatly diminished.

Some ten years later further improvements were made in the ventilation of the drains. Since then, typhoid has almost disappeared, if exception be made of a local outbreak some ten years ago, from a cause that was at once appreciated and removed. I say almost disappeared, because a case is occasionally imported into the town.

The well-known outbreaks of this disease at Guildford in 1867, and at Owen Darwin and at Lewes in 1874, were all traceable to the leakage of sewage into the water supply. Such outbursts, under a proper supervision (which ought to be constant and scientific), would easily have been prevented. The dangers arising from tainted milk come under the same category.

Typhus fever is a notable instance of the power of prevention. The offspring of filth and foul air, with their allies, bad and insufficient food, it has retreated further and further before improved sanitation, and from filling a very large space in the death-roll, it has shrunk into a comparatively small one—at least, in this country.

There is good hope that it may soon be banished altogether: certainly there is good reason to believe that it might be so banished. How much this desirable end depends on ourselves is forcibly illustrated by Dr. Hope, also speaking at the Bolton Congress. In his remarks upon Typhus outbreaks in Liverpool, he shows that much was done in face of very sluggish official co-operation, to check and isolate the disease. Yet through the neglect of the authorities, a man who died of tyhpus was left three days in a cellar, and became the means of infecting ten other persons, who in their turn infected others.

A keener vigilance on the part of the authorities might, as Dr. Hope infers, have prevented all this. But civilization is always open to fresh assaults. Can these be grappled with? Here is a test case.

What has been called locally the "new disease," has within the last year fallen upon the modern town of Middlesborough, in Yorkshire. It is a kind of infectious pleuro-pneumonia. Out of a population of nearly 70,000, this epidemic caused during the last year a mortality of 285, or about 41 in every 10,000. The great bulk of the sufferers, it is noticed, have been adult males, while women and children were less affected. As soon as the scourge arose, the Inspectors were set upon the track. As yet they have met with only partial success. While some of the men attribute their complaint to the inhalation of "slag-dust," doctors and others explain it by exposure and chill on leaving the over-heated foundries, or by the common unhealthy surroundings of a somewhat reckless population.

But its nature is recognised to be that of a specific febrile disease, distinctly infectious, allied to typhoid or relapsing fever. To have ascertained this is to have taken at its birth the first step to its prevention and extermination.

Further reports as to the origin of this epidemic and the steps which may be taken to prevent its recurrence are looked forward to by many with great interest.

Scarlet fever is in the same case. Carelessness either of individuals, or of collective bodies, is at the bottom of every outbreak. The advantages to be derived from a careful system of Prevention have been well seen in our town.

It is now many years since, in 1871, efforts were made in this borough towards the systematic isolating of cases of scarlatina, and they were at first carried on by private enterprise. An enthusiastic lady sanitarian, Mrs. Johnstone, seeing that the use of disinfectants and the isolation of patients with their attendants were potent means to arrest the spread of this disease, made it her business to search out cases of scarlatina wherever she could hear of them. She would call on the householders, whether rich or poor, and explain to them in great detail her views. She would exhort them to isolate the sick member completely; explain the methods of disinfecting all secretions, of putting up the carbolised sheet before the door, and urge the importance of cutting off all communication between the sick person and his attendant from the rest of the house. She made provision for the disinfection of linen before going to the laundress, and recommended where it could be sent with safety.

She secured the removal of infected or doubtful children from the day schools. She persuaded the needlewomen or tailors inhabiting infected houses to desist from taking in work, and these measures she took at the expense of offering subsidies to parents or workers who would be thus temporarily thrown out of employ.

Finding the impossibility of isolating by these means alone, with the help of a number of ladies and gentlemen, whom she interested in the work, she took rooms to serve the purpose of a temporary infectious hospital. By degrees she thus formed the "Sanitary Aid Association," consisting of a number of annual subscribers and a large and influential committee of clergymen and others, with herself as manager, and with nurses as assistants. These latter she thoroughly indoctrinated with her practical views. A work was thus inaugurated in the borough which in spite of much opposition and conflict was destined to bear important fruit.

An Act of Parliament exists authorising the sanitary Authorities to provide hospital accommodation for infectious disease. It was not long before the Town Council found it expedient to start their own hospital for isolation, and this part of the work soon passed out of the hands of the "Sanitary Aid Association." But work still remained for the volunteers. Their nurses still continued to visit infected houses, and to advise and help quietly and practically, where the visits of the Inspector of Nuisances would have been regarded as an intrusion, and thus, by their quiet and ready help, formed a valuable auxiliary in carrying out the instructions of the doctor in charge of the case.

Moreover, the funds of the Association were available for tiding over a crisis in the family, where, without them, it would have been impossible to prevent the bread-winners from carrying on their employments at the risk of spreading infection far and wide.

Our exceptional immunity from serious outbreaks of scarlatina, has doubtless been in no small degree the fruit of this organisation.

The "Sanitary Aid Association" has been the parent of many similar Institutions in different parts of the kingdom, of which I may quote Westminster as an example.

My friend before alluded to in this town tells me that the scarlet fever of the present day is a vastly different disease in severity to what he was accustomed to see in his early days. The cases which arise in the town are mild, the disease being most often imported from a distance, and even these are not generally of a malignant character. This altered type is no doubt largely due to improved drainage.

Outside the fevers, there are other ailments, more slowly, but not less surely affecting health and life, some of which are easy, some not so easy of prevention.

Among our domestic servants, want of ventilation is prolific of disease; if not of consumption, at least of that too common condition anæmia, or bloodlessness, which itself begets a brood of definite ailments. Not alone are bedrooms close and narrow, but basements add to these evils dirt and bad lighting, while ventilation is almost disregarded. The heat of the modern underground kitchen is raised to an extreme degree by the enclosed kitchener, or, still worse, American oven, inventions which by raising the temperature and stopping up, or confining that natural ventilator, the open chimney, have done much to foster ill-health. Further, it is the custom to erect gas heating and cooking arrangements without providing the smallest pretence of ventilation to carry off the fumes.

This practice cannot be too strongly condemned.

If the inhalation of gas products does not produce giddiness, faintness, and insensibility (and I have known it to do even this in a small bathroom where the water was heated by gas), it will certainly lead to a form of ill-health of which anæmia is the first outcome.

Hence it comes that our "Convalescent Homes," our "Homes of rest," and even our hospitals become peopled with pale, spiritless faces, and languid forms, which bear eloquent testimony to want of sanitary precaution.

In our own Hospital of Hastings, I had under my care alone, in the out-patient department last year, no less than 41 cases of anæmia, out of 259 patients, a ratio of more than one-seventh, which, surely, is deeply significant in so healthy a locality. Anæmia, however, is not a complaint of women only, though it is more common with them. Men employed in ill-ventilated and ill-lighted shops or factories, suffer from the same condition. But our young men—at all events, those in the better shops in country towns—have one advantage over their sisters in employment, they have their bicycle or rowing club, or some inducement to athletic exercise, after the day's confinement, promoting health and healthy sleep, and vigor of body and appetite. The young women are often too tired to do more than go home, perhaps to a room and atmosphere not much better than they have left.

Apart from good food and exercise, which are not so easy to deal with, light and air are the two essentials to the health of the employed, whether servants or shop assistants, and these ought to be insisted upon, for the absence of them is almost as harmful as bad drainage or fouled water.

Of all diseases or tendencies to disease, the inherited are the most difficult to oppose, for legislation can only lay the least of its fingers on them, and as passion is stronger than reason in most men, it will be long before individuals can be reckoned on to do the work for themselves—probably never. Certain it is that family or hereditary predisposition holds a leading place in the induction of phthisis, but obedience to the laws of health might do much to disinherit it in the course of generations.

Yet it must be allowed that in proportion as the knowledge of the more direct causes, previously overlooked becomes more extended, so does the estimation of heredity shrink in importance; for in proportion as damp and dust, and unwholesome emanations, and insufficient or improper food are recognised among the active general causes; and as local injuries offering impediment to the action of the lungs, such as pleurisies, inflammation, and the like, take their proper place as local causes, *so* does heredity sink in the reputed scale of causation.

The Drs. Williams point out that while 48 per cent. has been shown to be the number of Hospital cases which give a history of heredity among the lower classes, and while the records of Brompton Hospital give a percentage of 25, yet that records of their practice give a percentage of only 12.

They say: "The only explanation we can offer of the discrepancy is a difference in the class of the patients on which our statistics are based, from those on which other authorities are based," and they add, "it is likely that our small percentage in a class, from which its wealth is able to banish many of the most fertile causes of Phthisis, gives a more just estimate of the influence that hereditary predisposition, unaided by poverty and exposure to divers pernicious influences, exercises on the causation of Phthisis."

Niemeyer and other authors, both German and English, deny that consumption is hereditary as a specific contagion, while they allow that the *tendency* is inherited.

Whether this be so or not, at least we know that weakening constitutional diseases in the parents, such as gout, or asthma, or excessive indulgence in alcohol or the like, may render the next or succeeding generations prone to the same disease. Slowly and laboriously have we been arriving at the conclusion that uncleanliness, overcrowding, foul devitalised air, damp and dust, have been active promoters of the disease.

Take, for instance, the strange mortality in our army, years ago, from pulmonary affections.

While deaths from consumption in persons of the same age in civil life were 6·3 per 1000, they amounted in the cavalry to 7·3; in the infantry of the line to 10·2; and in the picked men of the Guards to 13·8. Stranger still, it was found that the troops hutted before Sebastopol in 1856 suffered a far lower mortality than those barracked at home.

The pith of these startling figures lies in the fact, that after the system was changed, with free ventilation established in the barracks, and sufficient breathing space provided for each individual, the tables were turned, and our soldiers no longer appear to disadvantage, in comparison to civilians.

Again, both Dr. Bowditch and Dr. Buchanan showed the importance of dampness of the soil as a cause of consumption. The former says: "A residence on or near a damp soil, whether that dampness is inherent in the soil itself, or caused by percolation from adjacent ponds, from marshes, or spongy soils, is one of the primal causes of consumption in Massachusetts, probably in New England, and possibly in other portions of the globe.

Again, it was shown that the death-rate from consumption in the city of Salisbury was reduced by nearly one-half in consequence of its subsoil drainage.

Injurious dusts and atmospheres incident, but not necessary to, certain manufactures, can be prevented, and legislation has done something, but should do more, to make such prevention absolute.

Past statistics, and even some present ones, tell a terrible tale of shortened lives, and ruined health under these conditions. Only recently, in some lectures by Dr. Arlidge, (reported in the Medical Journals), the fatal tendency to pulmonary diseases is pointed out amongst workers in our silk, cotton, woollen, flax, and similar manufactories: as well as in other fields of labour, such as wood and ivory turning, bronze-casting, and so forth.

In addition to the injurious effects of the dust or filaments, the air of the work-rooms is often kept at a high temperature, and sometimes, notably in the cotton-sizing sheds, is damp also, producing languor, loss of appetite, dyspepsia, and anæmia. Out of 1642 out-patients treated at Macclesfield Infirmary, of whom 922 were engaged in the silk trade, respiratory diseases constituted about one-fourth of the complaints treated.

The inferior cottons, Dr. Arlidge points out, require most sizing, and to secure the requisite heat and moisture, no external air is admitted, while jets of steam are let into the weaving-sheds, saturating walls, ceiling, and the clothes of the work-people. "No wonder," he adds, "that the operatives complain of debility, sweating, prostration, faintness, and impaired digestion." And may we add, that it is no wonder he invites legislative interference to prevent the carelessness of manufacturers thus sacrificing the artisans.

In dressing the linen-web a similar high temperature prevails, and this process is so unhealthy that only a few adult men, free from chest disease, are chosen; yet the average duration of employment even of these is only 16 years.

What prevention can do is shown in the case of Leek, where the mortality from consumption, as in other silk towns, was notoriously high, but is now happily as strikingly reduced, since proper ventilation was established in the mills, unhealthy mills rebuilt, and the artisans provided with improved well-drained dwellings. During the condition of lowered vitality, from whatever cause, the body becomes specially vulnerable to attack. The soil has lost its richness, and with it the power to grow good seed; but weeds grow apace. The germs of tubercle must be widely spread among us; but for them to fructify they must have an impoverished soil, and be sown with a lavish hand, otherwise they will fall harmless and sterile on their bed.

It was some seven years ago—in 1882—that Dr. Koch announced his important discovery of a specific Bacteria in tubercle, a discovery which has revolutionised our views on the nature of the disease and our mode of dealing with it.

When the bacillus is introduced into suitable media outside the body, such as blood serum, and maintained at a proper temperature, it is capable of cultivation, and the new organisms thus obtained, will, in their turn, produce tuberculosis in the rabbit or guinea-pig.

The intimate relations of this bacillus with tubercle is proved not only by its power of producing tubercular disease in the parts of the living structure into which it is introduced, but it is further shown that no case of tuberculosis exists without this organism being present; while it is absent from other diseases. When once it has taken root, there is no important organ of the body it may not implicate, and no limit to the ravages it may commit.

On the other hand, a limited amount of tubercle may lay dormant in the system, and, ceasing to multiply, may degenerate, die, and be cast off.

This micro-organism finds its entrance from without, as does that of every contagious disease, but its life history, so far as we know, differs from others in important particulars. It has a vitality so great as to resist the action of many germicides. But it requires special conditions to foster its growth. Its development is slow compared with that of the zymotic diseases. Herein lies our great hope of limiting and of preventing the spread of the disease.

The great source from which tubercle germs are derived, is, no doubt, the excretion thrown off from the lungs. Thus Dr. Cornet examined the dust taken from the walls of hospital wards, asylums, and private houses where phthisical patients had been located. He introduced this into the bodies of guinea-pigs, with the results that 47·6 per cent. died of tuberculosis inoculated with hospital dust, 17·6 per cent. inoculated with asylum dust, and 43·6 per cent. with dust derived from private houses.

In like manner Dr. Koch is of opinion that a phthisical patient is bound to scatter around him a large quantity of infective material, under circumstances in which he is commonly found. Dr. Cornet considers the expectoration comparatively harmless whilst in its moist state, as of course bacilli cannot evaporate, and Dr. Nägeli shows they are never found in the expired breath; but the danger arises when the excretion is dried and becomes pulverised.

More recently it has been recognised that milk derived from tuberculous cows may become an important source of infection, especially to the young.

It would take too long to cite the evidence of Dr. Woodhead, published during last year, from experiments made in Edinburgh, or that of Dr. Bang, of Copenhagen, in the same sense and about the same time.

At a Congress held in Paris last year the importance of this subject was acknowledged; and among the resolutions passed, was one recommending that dairies should be inspected to ascertain that the cows are not suffering from contagious diseases—including tuberculosis—capable of being communicated to man. Another, recommending that the public should be instructed in simple means of avoiding the danger incurred by using the flesh of tubercular animals, and in proper methods of disinfecting the excretæ of phthisical patients and objects contaminated by them. That consumption has any claim to be regarded as a contagious disease, is a doctrine, which in times past has gained few adherents in this country, although it was believed in Southern Europe. Rather have we clung to a fatalistic view of its incidence and unavoidableness. Once let it be admitted that the foe has a definite entity, and then may Sanitary Science boldly step in, and take up its place in the lists, to do battle with the greatest enemy which has ever assaulted the Englishman's home. For has it not been bringing to an early grave its tens of thousand victims? The total mortality from this disease has amounted to one-eighth of the deaths from all causes, and even this frightful record is a great reduction upon former years. Many observers have arrived at the conclusion that, under favourable conditions, consumption may spread by direct contagion.

When the Committee of Collective Investigation issued its enquiries to the members of the British Medical Association in 1884, the public mind was only awaking to the subject. And yet of 1078 answers from the members, 261 gave their experience in favour of contagiousness, while 39 were doubtful on the matter.

A limited amount of positive evidence on such a subject, out-weighs much negative belief.

Dr. H. Bennett professes himself a non-contagionist, and yet the whole point of his recent important letter goes in the other direction. He says, "I am convinced that danger exists when the healthy are made to live day and night in close contact, in an unventilated room or cabin, with a person suffering from phthisis in an advanced stage."

"My memory recalls several cases where consumption has appeared to have been thus conveyed from husband to wife, from wife to husband, from mother to child, and *vice versa.*"

He quotes a remarkable instance of a young English officer of 27, a model of health and strength, with perfect antecedents. He came home from New Zealand with a young wife in an advanced state of consumption. They occupied a small cabin, the windows of which were seldom or never opened during her lifetime. The voyage lasted four months. She gradually got worse, and died three weeks before the ship arrived. A few weeks after his arrival in England, he developed symptoms of phthisis, and died a year or two afterwards.

Dr. Williams, while contending that phthisis is not, in the ordinary sense of the word, an infectious disease, admits that its communicability is possible under favourable circumstances. Once let this contagiousness be acknowledged, who shall say where the limits are to be drawn?

In the Consumption Hospitals the authorities have not been able to trace direct contagion among the patients, or from patients to nurses. But in England cleanliness and ventilation are the rule in hospitals, and act in a preventive manner in proportion to the scrupulousness with which they are carried out. In Germany, hospital statistics give a different account, and Dr. Cornet has asserted that 63 per cent. of nurses fall victims to tuberculosis. He remarked further, that in orphanages, where strict protective measures were followed, tuberculosis was kept away although the children might be the offspring of phthisical parents.

We are thus led to the conclusion that the incidence of phthisis is determined by a number of factors, which can be more or less accurately estimated.

The prime one is the introduction of the bacillus tuberculosis into the body.

Undoubtedly, this introduction may be the result of heredity, but this origin is less frequent than has been supposed, while susceptibility is no doubt entailed by descent.

The facts adduced go to prove that chief among the fostering agencies of tuberculosis, is the prolonged inhalation of re-breathed air, as met with in crowded and unventilated buildings :—That the influences of damp and dust are other important agencies. Further, that much depends upon the condition of the tissues which are the subject of attack, the damaged, unhealthy, or inactive surfaces being the most vulnerable. And, lastly, that the danger is in proportion to the intensity of the infecting virus.

The preventive measures to be adopted to stay the spread of this terrible scourge to the population, are but the corollary of the above conclusions. I will summarise them almost in Dr. Ransome's terms. They are these :

1.—The destruction or disinfection, as far as possible, of the tuberculous expectoration.

2.—The drainage of the soil, and the removal of all filth.

3.—The prevention of irritating dust, under whatever conditions it is produced.

4.—The avoidance of overcrowding, and the provision of ample ventilation of dwellings and workshops, whether by day or by night.

5.—The discouragement of marriages among phthisical individuals.

6.—And the promotion of the vigour of the body by every available means.

With the adoption of such measures it is not too much to hope that society may expect to see a marked decrease in the mortality from this dire disease. Familiarity has led to too much tolerance. Aroused to the knowledge that preventive measures have their proper sphere in this, as in other fields of operation, both the profession and the public will do well to exercise those precautionary measures which knowledge and experience dictate. In times gone by leprosy with its Leper Hostels, was not uncommonly met with in this country. Now it has disappeared from our midst. Would that we might cherish the hope that consumption might follow in its wake.*

In this paper I have avoided entering largely into specific details and statistics, because these have been already put before the public by so many of our ablest leaders in sanitary science, at so many similar Conferences.

We, in fact, know what to do, and it only remains to do it. Lord Salisbury's warnings to the Chamber of Commerce, are but too true. "You cannot," he says, "move mankind by exhorting them. The limits of exhortation are very speedily reached. You cannot move mankind by dwelling upon their duties, or upon the high principles which they ought to accommodate themselves to. You can generally move them, mainly by showing them there is something to gain by what you wish them to do; that there is some disadvantage to be avoided.'

In our case the gain and loss are obvious.

Many grave diseases are still beyond our grasp. We have not yet grappled to the full with cancer or hydrophobia; but we may hope in time even to throw these.

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* A comparison of some interest may be drawn between tuberculosis and leprosy. Leprosy spreads most easily from parent to child, but its contagiousness is acknowledged. The conditions of its development are bad food, uncleanliness, over-crowding, unwholesome, unventilated dwellings. I was assured by a Pathologist in a Leper Hospital in Norway that the bacillus of this disease is almost identical with that of tubercle, though it is slower, and even more sure and deadly in its ravages. With a view to prevent the extension of this scourge among the inhabitants, Norwegian law provides for the isolation of its victims, where practical, in their own homes, or otherwise, in Hospitals established for that purpose. In one of these I was assured by the Medical Officer, that no fear is entertained of the spread of the disease to the attendants, among whom the conditions of good sanitation are sufficient to ensure immunity from attack.

We are at present engaged in a new encounter with the latter.

We have seen, however, how many almost as deadly enemies have been worsted more or less decisively. We know how typhus, the disease of filth, has been retreating step by step during the last half century, and presumably might be banished altogether by wise regulations strictly carried out. How typhoid again might be served in the same way by absolute rules ensuring healthy drainage, pure water, good supply, and so forth. How scarlet fever and even cholera are subject to the same or similar laws. It has, indeed, become more and more clear, with fuller light, and further experience, that disease is not a necessity, that it is not even natural, that it has lessening claim to be looked upon as an inheritance.

Undoubtedly, certain weak points in the organism—primarily due to accident, and doubled by selection—are inherited, but the affections these give birth to are not *specific;* they only hurry on the process of natural decay which every denizen of this world is born to and cannot fly from.

What is to be hoped for, and what can be done, is that with our accumulated knowledge and experience, and with the weapons science has placed in our hands, we may at least keep the enemy disease at a respectful distance, by making our lives and homes as healthy as we have now the means of doing, and by such wise legislative provisions for the great sum of life—the good and evil of which must affect the individual units—as shall serve to secure the health and so the happiness of mankind.

SANITARY REFORM IN RELATION TO THE FINE ARTS

By WYKE BAYLISS, P.R.B.A., F.S.A.

In addressing you on the subject of the Fine Arts in relation to Sanitary Reform, I am met by two difficulties, a Scylla and Charybdis that might well appal one who had not set out with a determined purpose, or was not sure of his way. The first difficulty is that the work of the artist and of the sanitary engineer seem to stand so very far apart in our minds, that I may be challenged with the question, "What have they to do with each other? Speak about either of the two things, and we will listen. But let us have one thing at a time." The second difficulty is that the two—Art and Sanitation—are so nearly identical, are so interwoven in their action and re-action, that it may be too hastily assumed that anything I may have to say regarding their relation to each other must necessarily be obvious and trite.

Now I am not afraid of either of these difficulties. In simply stating them I have left both behind, and am content to let Scylla take care of Charybdis.

For, when you come to look into the matter, What is Art but the Science of Beauty—and what is Sanitation but the Science of Health—and are not Beauty and Health pretty nearly synonymous? At any rate, the two things go very much together. They "keep company," as the lads and lassies say. If Health is the foundation of the Temple of Beauty, Beauty is the shrine in the

Temple of Health. And this is not a modern discovery; it is as old as the hills. Those of you who have visited Rome and studied the remains of the Imperial city, will, I am sure, have brought back, whatever else you may have forgotten, the remembrance of two things —I mean the great aqueduct and the cloaca maxima —the aqueduct, magnificent in its endless array of splendid arches, bearing into the city from the Sabine mountains a river of water—the cloaca, draining the low-lying land of the Forum, and interesting because it is the earliest known application of the arch in Rome. Do you remember these things as the work of the Architect, or as the work of the Sanitarian? Let me ask you, from to-day, to think of them as the eternal type of both Art and Sanitation, one in their origin, one in their aim—the bringing of the pure water of life into the soul—the cleansing it of the foul humours of mental stagnation.

But these are general statements, and I will come to particulars by laying before you a series of propositions to which I invite your assent.

The first is, that the progress of Art in our country and the free development of some of its finest characteristics, have been arrested by the foul condition of the atmosphere of our great cities.

The second proposition is, that the appliances necessary for the sanitation of our dwellings are not irreconcilable with the desire for beauty.

The third is, that the law of Beauty as well as the law of Sanitation is that things are right only in their right place.

The fourth is, that if you can do nothing better with works of art than smoke them black, like flitches of bacon, your artists will probably (according to the law of supply and demand) give you works suitable for that purpose.

My fifth proposition is, that any great scheme for the future of National and Historic Art in England is hopeless so long as this state of things continues.

And finally, I shall put it to you, that to find a remedy for these evils, the Artist looks to the Sanitary Reformer.

Upon each of these propositions I will say a few words, though, having regard to the limited time at my disposal, they must be very brief.

And, first—Do we sufficiently realise how the advance of Art is hindered by the insanitary condition of our great cities? Take, for instance, Architecture, and see how *dirt* stops the way. How it stops the way, not only of the traffic in our streets—an army of scavengers may cope with that—but how it stops the way of all the splendid developments of decoration, by virtue of which Architecture takes rank amongst the Fine Arts.

I have just returned from one of the beautiful cities lying amongst the Apennines. There the façade of a house or public building is as finely engraved, in proportion, as a signet ring—as delicately coloured, by the use of brick, or stone, or marble, or terra cotta, as an inlaid cabinet. What resources of the chisel of the engraver, and the saw and wheel of the lapidary, and the smelting-pot of the worker in mosaic, are lost to our architects, simply because of the foulness of our atmosphere—a foulness not inherent to it, but made by ourselves in the innocent process of cooking our mutton chops. I suppose that London must have its mutton chops, and that they must be cooked; but they are cooked at a heavy cost if the cooking of them is to debar our architects for ever from the use of polished marbles, mosaics, and delicate bas-reliefs.

For, observe, the fault is not to be charged to our climate. Orvietto, indeed, is on a hill, where the air is always pure, but Genoa, and Pisa, and Venice are in reach of the wet, salt mists of the sea—like Hastings—and yet they are beautiful. Ah, no; it is not the climate we have to fight against. It is the climate plus dirt. It is the climate in unholy alliance with the guerilla contingents of smoke and foul gases that decimate our forces, and carry foolishness into the councils of our building committees. Are you going to help us against this enemy? Are you going to clarify the air of London, and Liverpool, and Manchester, and the other dark places of the Earth. If it be true that "the dark places of the Earth are full of the habitations of cruelty," it is equally true that they are full of the habitations of ugliness. Are you going to give to the artist that which he values as his life—that without which life itself is of no use to him—I mean *light*. If you will enable us to *see* London, I promise you that Art shall make it beautiful to look upon.

Have I said too much about the chimneys? Well, then, let us turn for a moment to the gutter; for we must not be afraid of using rough words, if rough words are necessary to express our meaning. I speak as an Artist. If you, in the utilitarian enterprize of Sanitary Reform, have a department which may be called the *science* of the gutter—we, in the exalted regions of idealism, have also a department which may be called the *art* of the gutter. And this leads me to my second point, that the appliances necessary for the sanitation of our dwellings are not irreconcilable with the desire for beauty. See how naturally the aims of the Architect fall in with the aims of the Sanitary Engineer. For instance, to take a case that comes particularly within my knowledge. In the building of a Cathedral it is necessary to provide channels for the flood of water with which a sudden or heavy rainfall will deluge the roof. These channels are made to project in such a manner that the rush of water shall be carried outwards, away from the surface of the walls. But the Architect who designs all this is not a builder only, but an artist also. Under his touch, therefore, the gargoyle, common in itself, and mean in its application, is ennobled by a secondary use. It is a gutter, but it is more than a gutter, as an architect is more than a builder. It is fashioned into some shape that shall add another beauty to the fabric.

Into some shape—yes, but what shape? Shall it be derived from the flora or the fauna, that give their wealth of loveliness to the sculptor's work in wood or stone? There is no link of association between these and the purpose to be fulfilled. Shall men and women bend downwards with mouths agape, to scatter streams of water on the incautious passer by? Their places are within the Church. Shall the Angels be made to fulfil this gentle office? Rather let them, with outstretched wings, bear up the fretted roof of the choir, looking down with mild eyes upon the worshippers. But the fiends!—the fiends that come with the night winds, bringing with them the fury of the storm. The fiends—that lurk in the miasma of foul air. The fiends—that clamour at the painted casements, which they cannot break, because the sword of Michael, with which he drove them out of Heaven, flames there. The fiends—that rock the great steeple to its base, if only they may shake down the cross uplifted high in air. The fiends—that beat despairingly against the massive doors, strong with a strength beyond that of oak or iron. Transmute *them* into stone! Let *them* grin downwards on the happy throng which crowds the threshold *they* can never enter.

Now here is a strange thing. The very aim and purpose for which our cathedral is built is to make war against the Wicked One and all his hosts. And yet, just at the critical moment, when the architect is at a loss how to deal with an essential part of his design—lo! of all things in Heaven and Earth and Hell—it is "the fiends" who come to the rescue. And why not?—if it be true that in Art, as well as in Science, nothing is to be regarded as common or unclean if only it be in its right place. That is my third proposition. Whether a gutter is in itself "a thing of beauty" depends upon the point from which it is viewed. Is the hippopotamus a thing of beauty? As he lolls against the bars of his prison house at the Zoological Gardens, with rolling eyes, and huge mouth opened wide for cakes and sweetmeats, it must be admitted that his shape is not elegant, and that his countenance is not attractive. But in his right place, it is a very different matter. On the broad shores of the Nile, when the landscape is shimmering under the blaze of a tropical sun; when as far as the eye can reach there is nothing but the burning stillness of the vast solitude of vegetation without life—see! that mighty rush, as Leviathan passes to the water; see! the white foam lashed to the skies, and through it the purple and gold of his harness, iridescent with light, startled from its sleep upon the river. The sea-horse is himself again. Offer him a biscuit now!

It is thus that Art deals with Sanitation. The gargoyle, if placed upon a pedestal in a drawing-room would not add a grace to the apartment. But in its right place, high up, that is, upon the Cathedral roof, casting its deep shadows from the meridian sun, or touched by the silver of the moonlight, there it is as beautiful to the idealist as it is useful to the utilitarian.

But the gargoyle serves another purpose. It serves to transfer our thoughts from Architecture to Sculpture. The gargoyle is essentially the design of the Architect, but it brings the Sculptor into the game, who, mounted on high scaffolding, may still find work to do in the fretted roof, or crocketed spire. But the Sculptor does not aspire to remain, like St. Simeon Stylites, always on so high a pinnacle. He would like, sometimes at least, to descend to the tympanum of an arched doorway, or the floreated capital of a column, or even to the pavement of the street, and show us what he can create in the shape of a lovely bas-relief, an acanthus scroll, or a statue. But if he attempts such a thing what will become of his work? What *has* become of the few works of sculpture that are supposed to adorn London? That is my fourth question. Do they not look as if they had suffered martyrdom at the hands of the street gamins on the Fifth of November? They are absolutely black with slime. Is that the best thing you can do with them? If they are to be treated as Guys, why should they not be made as Guys? The

Sculptor cries for help. Who will save him, and his work, from this degradation? Who will give him the hope of a future? We look to you. When you have cleared our great city of its tenebrous pall, and given us light—when you have cleansed our temple, we will decorate its shrine.

And then Painting. What a glorious art it is in its noblest form—that of mural decoration! And yet no Englishman who has seen Tintoretto's designs in the Ducal Palace at Venice, or Luini's great fresco in the Church of the Angels at Lugano, or Raphael's decorations in the Loggia of the Vatican, can feel otherwise than that we are cut off absolutely from at least one phase of Art, and that, as I have said, its noblest and grandest. But why? Again I say it is not the climate that decimates our forces. It is the climate plus dirt.

What, then, is our hope for the future? Have we any hope for the future? My fifth proposition is, that any great scheme for the development of National and Historic Art in England, is hopeless, so long as this state of things continues. This is a hard saying, but I will put it to the test, by venturing to make a suggestion. We are a nation with high aspirations, ready and strong to do great deeds which shall be worth recording. And we have painters capable of drawing pictures on a wall. Let the nation, through its representatives, choose the event, and the artists choose from among themselves the man who shall paint it. One picture every year—of the chief event of the year, or the most noble deed done, or the highest good achieved. In the choice of subjects there should be no boastfulness of petty princes blazoning their puny exploits. Nothing should be recorded that had not stirred the heart of the people. In the choice of painters, there should be no voluntary display of raw ambition, or fashionable frivolity, or senile declension; they should be chosen by the suffrages of their fellow-painters in their prime, so that their work would become, in itself, a true historic record, not only of the executive power, but of the collective judgment of each living school of Art, as it arose, flourished, and passed away. There is no genius of which the nation is proud that would be waste material, or might not take its share in the enterprise. The pencil of Leighton would not be too refined, nor that of Watts too serious, nor that of Millais too robust. Landscape, the glory of English art, would find its place. Even the sculptor need not stand aside, for the sequence of glowing canvasses might be varied by a group or a bas-relief in bronze or marble. The selected subject, and the name of the artist chosen, might be announced annually with the opening of the Exhibitions of the year, and the artist should be allowed one year in which to produce his study or cartoon of the picture. Then his cartoon should be exhibited, to bear the criticisms of the people. Few errors of historical importance would escape such an ordeal. Finally, the work should be completed by the artist, under no control, save the influence those criticisms may have wrought upon his mind. There would be no risk of failure in such an enterprise. The events will come; the nation may be trusted for that. The men will come; some are with us even now, ready to begin the work. This would indeed be true Historic Art, the marriage of Art with History. And think what would be the issue—in ten years, in fifty years, in a century. We look with wistful eyes into the future, and picture to ourselves what we should see under such a scheme as this. Unless the future altogether belie the past, we should see such scenes as these.

The hospital at Scutari—the sick and wounded of our soldiers, on their pain-stricken beds—and then—

> Lo! in this house of misery
> A Lady with a lamp we see
> Pass through the glimmering gloom,
> And flit from room to room.
>
> And slow, as in a dream of bliss,
> The speechless sufferer turns to kiss
> Her shadow, as it falls
> Upon the darkening walls.

It is "Santa Filomena." It is Florence Nightingale,—herself—not an imaginary suggestion of what she might have been, painted a hundred years after we had lost her, but she herself—

> As if a door in heaven should be
> Opened, and then closed suddenly.

And then we see the interior of a class-room in London, with a few grave men, and thoughtful women, and the pale faces of many children—large-eyed wondering children—who shall grow up to see themselves in this picture, and to know that they were painted there because the opening of the first Board School was a revolution, mightier in its results and more far-reaching than any that have yet been chronicled in England. And then—for the Sanitary Reformer must not have it all his own way — we see the Senate House at Cambridge, and the first girl-graduate receiving her degree, that shall acknowledge her to be as wise as Merlin, and leave her still as beautiful as Vivien.

We look for scenes like these, because, although the past returns no more, yet the future shall be like it. Do we look for them in vain? That is a question that can only be answered by the nation.

Can only be answered by the nation, did I say? Ah, no! The nation cannot answer it except through you. We wait for you. Dear as are the remembrances of the past, splendid as are these visions of the future, we can do nothing to realise them without you. Our frescoes peel from the walls; our paintings blacken in the foul gas; our mosaics corrode before our eyes; our statues trickle down with greasy slime. But when you have cleared our great city of its tenebrous pall, and given us light—when you have cleansed our temple, we will not be slow to make its shrine beautiful.

That is what I, as the President of the Royal Society of British Artists, have to say to you, the

President of the Congress of Health. We long for your city of Hygiea. We know that Sanitary Reform is working for us. The Science of Beauty greets the Science of Health. All that I have said of these three branches of the Fine Arts—Architecture, Sculpture, and Painting—in association with our national monuments is true relatively of every subsidiary development of Art. *You* would cleanse the house, and flood it with light—*We* would cleanse the mind, and fill it with beauty. And see how the two things, *sweetness* and *light*, which I call "the holy alliance," follow each other in natural sequence. Go into the dark little rooms of the labouring classes, and, if it is not indeed too dark to see, observe the dreariness of the surroundings of our poor. They "toil and spin," but they are by no means arrayed like Solomon in all his glory. They work like the bees, but they are not

> Singing masons building roofs of gold.

How can Art penetrate to these dismal chambers? You can lead the way, and the artists will follow. Give them light, and they will at least see the dirt and the nakedness of their walls. Give them light and cleanse their walls, and the cheap print will follow. And the print, though it may be cheap, need not be nasty. As it becomes cheaper, it will become better, and they will become better and happier with it. For with the sight of Art will inevitably grow the love of Art, and with love, happiness—and happiness is one of the most powerful disinfectants the world knows.

I fear that I have already detained you too long. And yet I would add one word more. Why have I ventured to respond to the invitation to address you on this subject? Why should Art be represented at a Health Congress? It is because Art is one of the environments of our lives that is daily shaping them to fair or foul issues. It is because Art and Sanitation are, after all, very near akin. For bad Art means much more than bad artists. It means dreary surroundings in our dwellings, ignoble buildings in our streets, evil thoughts in our hearts. The miserable hoardings of our railway stations, plastered with hideous posters that crush our eyes as with a weight, forbidding us to raise them from the ground;—the blank walls and ungainly furniture of our dwellings that make mud in our minds. These are not necessary evils. It is we who have made them and cursed them with ugliness. They only return to us the curse in mental depression, with its inevitable tale of physical suffering. If we, as artists, are interested in your work, you should be equally interested in ours. I know that the erection of a fine edifice on the north side of Trafalgar Square, and the transfer of the Arch of Titus to the east end of the Strand, would not efface the calendar of crimes to be tried at the next assizes. But because Art cannot do everything, it is unreasonable to conclude that it can do nothing. It can at least do this. It can so transfigure a little colour that lies upon the palette into a living presence that our hearts shall beat faster only to look upon it. It can so link thought with thought, and put them into sweet words, that we may look through Shakespeare's eyes upon an English garden of three hundred years ago—or hear the storm-shaken pines which make music in the Volkslied—or see the shadow that lay dark on Dante's life as lies the shadow of the cypresses upon his grave at Ravenna. It can so build stone on stone, and shape them into beauty, that the architects of the thirteenth century shall speak to us of the nineteenth, making us stronger for our duty, and happier in performing it. For Art stands alone in this, that it engages not some, but every faculty of our being. Like the summer clouds that fill the sky, Art sweeps across our world, drawing into itself all our aspirations, all our scientific attainments, every tender emotion of our hearts. How beautiful are these summer clouds, now ranged in lines like the battlemented walls of a distant city, now massed together like an army with banners, now drifting through the azure in a myriad of æthereal shapes, like a company of angels looking down on us from heaven. How beautiful is Art in the splendour of its imagery, in its storms of passion, in its serene contemplation of things divine. But it is only Art! But they are only clouds! Does Science say they are only clouds? How, then, are the furrows made soft with the drops of rain? So, then, the clouds are of some account.

And Art? Believe me, no tender thought, or noble aspiration, or high enterprise, is lost to us because Art fashions them into beautiful shapes. They come back to us as the rain comes from the clouds, and they make our lives fruitful in faith and wisdom and love. But the artist lives, and works, and dies, and his works perish with him. Why should they perish with him? That is the one question I press upon you to-day. They need not perish with him. In the city of Hygiea, if not the artist himself, at least his works shall be immortal.

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EDUCATIONAL OVERSTRAIN.

By HENRY HUMPHREYS, M.D.

At the call of our President I appear this evening to address you in the place of the noble lord, whose absence we so much regret. I am sure that, understanding as you do, the circumstances under which I come forward, you will treat me with much indulgence. No one of us in here could adequately supply the place of Lord Brassey, whose services in this borough have been of the very highest kind that is possible for man to render. Yet there are many present at this Congress whom we should have delighted to hear, and I sincerely regret that it has not been possible to arrange for one of them to speak to you to-night.

The topic on which Lord Brassey was to have addressed you is not announced in the programme; but the aspects of education, which I wish to bring to your notice, are, I think, not inappropriate to an evening which should have been occupied by him. For I consider that amongst his many good deeds those in the cause of education have been the greatest. In building in Hastings the beautiful Institution which bears his name, he set before us a model of good architecture, which was much needed. Then he placed in it his own extensive library, embracing works on all branches of science and literature, and made it the home of a School of Art. Then, lastly, he made over to the town this beautiful building with its treasures as a munificent gift. I trust that his noble example will not be lost upon us, and that many, although it may be only in a small way, will be stimulated to do something in the cause of education.

Now, in the first place, what do we mean by education? The literal meaning of the word is "a drawing out.' It is a drawing out of the intellectual, moral, and physical faculties of the human being. A right system of education should draw them out in due order and proportion; a wrong system, by neglecting the order and the proportion, may do much to hinder the development of the faculties. These faculties depend upon a healthy body, and more especially upon a healthy brain. The brain is what is called "the physical basis of the mind," and there is a close parallelism between the condition of brain, and the condition of mind. Thus, pressure on the brain, such as that caused by a depressed piece of bone when the skull is fractured, deprives us altogether of consciousness, and, therefore, of mind. On relieving the pressure by raising the depressed bone, consciousness and mind are restored. Now the brain is a wonderful organ, transmitted to us through our parents from remote ancestry. Its development, like that of all highly-organised structures, is very slow, and it takes place in a certain definite order. From observations on the dead subject we learn how it increases in size through certain years of life, how it becomes divided into hemispheres, lobes, and convolutions. By chemical processes we can analyze the substance of which it is composed; by the microscope we can examine its minute structure and trace the connections of the wonderful cells which are bedded in the coating of its convolutions. But all the appliances which modern science has placed in our hands do not help us to find out what mind is. We do not discover mind by analyzing the brain and nervous system. We find gases, mineral matter, fatty matter, nitrogenous matter, but mind we do not find. Mind must be studied by watching its earliest manifestations in the infant, its growth in the child, its ripening in the adult. By examination of the contents of the individual consciousness, it must be studied as it is developed in the individual. The parallelism I have mentioned, which obtains between brain and mind, extends to the development of both. When the weight of the brain falls below 30 oz., the possession of anything like human intelligence becomes impossible; whilst, on the other hand, men of unusually high intelligence have brains much above the average weight—which may be taken at 49 oz. The brain of Cuvier, for example, weighed 64 oz. On the other hand, in some idiots the brain does not weigh more than 11 oz. At birth, the average weight of the brain is a little under 14 oz., and from this time it gradually increases in weight, attaining its maximum at a period between the 20th and 40th year. In the man, the greatest average weight of the brain is found about the 35th year, and it is at this time that his powers are generally matured and at their best. In the woman, the greatest average weight of the brain is attained about 10 years earlier, and the maturity of their power is likewise reached at an earlier date than in man. A study of these and like facts teaches us that the development of mind proceeds along certain definite lines.

Further, we can study mind in its historical development. The mind of man controls the forces of Nature, and constructs science. The origin and progress of science mark the development of mind in times past, and form the surest and best landmarks for studying its mode of action.

A study of facts like these will convince us that Nature has laid down a certain order for the development of mind, and upon it all rational systems of education must be established. Any departure from this order may overstrain and injure the mental powers, just as injudicious gymnastic exercises may do in the case of the bodily organs. But although education has been carried on for so many centuries, yet as a science it seems to be still in its infancy. Facts need to be collected and sifted, generalisations made, laws discovered. School registers, on a larger and more extensive scale than those now in use, resembling hospital registers, will perhaps be devised to record the physical and mental attainments of the pupil on admission to the school, and their subsequent development. In this way a science of education will one day be established, but years must elapse before it can be anything like complete. Our present knowledge, however, is enough to enable us to see in most of the modern systems of education many faults and shortcomings, the evidence of which I proceed to examine, and the remedies for which I shall endeavour, to the best of my ability, to indicate.

I shall first give you an early example of overstrain. In the museum of the Capitol at Rome there is a small marble monument which commemorates the death of a schoolboy, Q. Sulpicius Maximus. The monument dates from the reign of Domitian, who in A.D. 86 instituted a competitive examination, in which this boy won the prize, the subject for competition being some Greek verses on the expostulation of Jupiter to Apollo for his rashness in allowing his son Phaethon to drive the chariot of the sun. Part of the prize poem, which is said to be a creditable performance, is inscribed on the monument together with a full length portrait of the youthful poet holding a scroll in his hand. The boy died at the age of eleven, too probably a victim to the overforcing of his powers.

I am not aware that any other monument of the like kind has survived the ravages of "the Goth, the Christian, time, war, flood, and fire," which have dealt so hardly with the ancient city, nor that the evils of forcing in education had attracted the notice of the writers of those early times. But the monument tells us unmistakeably that those evils were not unknown, and thus the parallel which holds in so many respects between Rome with its enormous possessions, with its overgrown city and depopulated rural districts, and our own country at the present time, may probably be extended to the system of education also.

Amongst those who have written on the subject which I have chosen for my paper, the foremost place is occupied by Sir Crichton Browne, who in 1884 brought out his famous Report on Overpressure in

Elementary Schools. In forcible and eloquent language he gave his inferences resulting from investigations into the condition of the children in a large number of elementary schools. He found that 46 per cent. of them suffered from headaches, that many talked in their sleep about their lessons, that many were affected with somnambulism. The headache in a certain number of cases undoubtedly formed the connecting link with graver nervous disorders which developed later on. Meningitis and inflammation of the brain were the most important of these, and had relatively increased in frequency in late years. The increase in insanity was probably to some extent due to the same cause. It was suggestive, too, that the great increase in the number of suicides coincided in time with the modern extension of education. Moreover, as one teacher observed to him, the dull children not only broke down in health under the system, but became more stupid, and seemed to lose in general intelligence what they gained in mere technical knowledge of reading, writing, and arithmetic.

The Report was followed by severe official criticism, the main points of which were that the observations were loose, that much of what was urged was founded on mere surmise and was incapable of such proof as would be accepted in the law courts. But if there was some indefiniteness, owing to the extreme complexity of the subject, about the connection between extended education and some of the graver nervous disorders, the next phase of the question brought facts into great prominence, in the meaning of which there could be no possible mistake. These facts were those relating to the spread of defects in sight, especially short-sightedness amongst the children of the poorer classes. A very important lecture giving the salient facts of the matter was given by Mr. Brudenell Carter in April, 1885.

As a great deal of this part of the lecture relates to short sight, a few words on this subject should perhaps be introduced here. In short sight the eyeball has become elongated in the direction from before backwards. The predisposing cause of elongation is a certain weakness in the coats of the eye, near the spot where the optic nerve enters, and this weakness is supposed to be transmitted from the parents. Now the muscles which move the eyeball are attached to the front part. On contracting they press on the front part, leaving the back part of the ball unsupported, and this, if weak, yields to the pressure communicated to the contents of the eye by the contracting muscles. Not only does the outer coat of the eyeball become stretched in this way, but the extremely delicate and important inner coats, the choroid and retina, become stretched also, and the stretching causes them to waste. Now supposing that a condition of short-sightedness has been established in this way, it is easy to see how rapidly it may go from bad to worse. Objects, which before were seen at distances, have now to be brought much closer to the eye than before. To see them the eyeballs have to be brought into greater convergence, and to effect this, the muscles of the eyeball must contract more energetically and so cause greater pressure than before. Moreover the back part of the eyeball is in a weaker state than previously. Thus, whilst the pressure is increased, and the power of resistance diminished, the back part of the ball may be expected to yield more than it did in the earlier stages of the disease.

Meanwhile in Germany the alarm had been given that the schools had become nurseries of short-sight, and the subject was worked out with characteristic German thoroughness by Dr. Cohn, the distinguished oculist of Breslau, who embodied the result of his investigations into this matter in a work entitled the Hygiene of the Eye, a most valuable book of reference, which has been translated into English. Some of his conclusions are very striking, but I shall only have time to refer to them very briefly. He says "in village schools the percentage of short sight is very low, whilst in town schools the number of short-sighted scholars constantly increases with the grade of the school from the lowest grade to the highest." He discusses the question of the heredity of short sight, which Donders in his great work taught.

He considers that the transmission of a tendency to short sight is at least highly probable, but that in many cases without any hereditary predisposition, short sight is developed by other causes. His caution here contrasts with the pronounced opinion of another great oculist, Erismann, whom he quotes, who, holding that short-sightedness is hereditary, predicts that a few generations hence, all Europeans, or at least all those living in towns, will be short-sighted. Cohn insists strongly upon remedial measures. The schoolrooms must be well lit, and situated in open spaces. He found that the narrower the street where the school was, the higher the opposite houses, and the lower the story in which the lessons were given, the more numerous were the cases of short-sightedness amongst the scholars. The differences were most striking. In some new elementary schools built in the wide streets without the gates of Breslau the percentage of short-sightedness ranged from 1·8 to 6·6, whilst in the corresponding schools in the heart of the old town it ranged from 7·4 to 15·0.

He has a long chapter on the construction of the school desk, a matter which he considers to be of the highest importance. He thinks that the best make of desk is one which can be drawn out like the secretary, so as to prevent the pupil from stooping forward and bending down his head.

He thinks that there should be permanent medical oversight for all schools; that each school should have its own special doctor, whose orders must be carried out. Amongst other duties the doctor would have to close without mercy any school which might be too dark or otherwise injurious to health, unless the necessary reform could be at once carried out. He would also have to examine every year the eyes of each scholar. The book, as you will see from these few extracts, is a thoroughly practical one, and gives one much hope in dealing with the subject of which it treats. In support of some of Cohn's views I shall quote some extracts from a letter written by Mr. St. Clair Buxton to the *Standard*, Dec. 19, 1888. After mentioning that enormous numbers of children are brought to the Ophthalmic Hospitals on account of defective vision, he says: "There is no doubt that the relief afforded by the use of properly adjusted spectacles forms the sheet-anchor of hope in this quarter. Now that children are compelled by law to attend school, and to use their eyes for many hours daily in the performance of work which must greatly impair their activity if optical errors be present, would it not be fair that the authorities should insist on an ophthalmic examination being made in all cases before children enter Board Schools?" and again, "Surely it is not a very great thing to ask that Government, which compels children to use their eyes, should also take care that these eyes are fit to be used. A systematic visitation of all the Board Schools by an ophthalmic surgeon is all that is needed."

I pass on now to a few illustrative cases, which have been under my notice during the past few weeks. The first is that of a boy aged 10½ years, the step-son of one of the medical practitioners of this place, who has given me a careful account of him. The boy's father died of heart disease which came on after rheumatic fever. His mother is healthy, his brothers and sisters somewhat delicate, suffering much from colds, and having a tendency to grow somewhat too rapidly. The boy himself had been considered healthy. At the age of 7, however, he began to suffer from sick head-ache, the attacks of which were very violent and used to come on after unusual excitement or fatigue. He was instructed at home till September, 1887, in which year he began to work harder, and his attacks became more frequent. Up till this time nothing was observed to be wrong with his vision. He was now sent to boarding school to be prepared for the Royal Navy entrance examination, and having abilities and application he was placed in a class with boys 2 or 3 years his seniors, against whom he managed to hold his own. He was frequently found to be reading during play-hours, and in fact, whenever he had an opportunity. About Midsummer, 1888, it was noticed that he could not see white figures on the black-board 8 or 10 feet off, that he failed to see names of streets and of shops on the opposite side of the way, and also that he had some difficulty in reading his music. Unfortunately preventive measures were not taken at this time, and he continued to attend school until last Christmas. In January of the present year he was taken to Mr. Tweedy, who found that a high degree of short-sightedness had already developed, and that this was attended with such congestion of the optic nerve, and such change in the choroid membrane, that his sight could not be materially improved by glasses. Mr. Tweedy expressed a hope that the condition might to some extent improve under rest and treatment, but strongly advised that the boy should not return to school for at least three months, and that in the meantime he should refrain from using his eyes for near work.

On April 2nd he was again taken to Mr. Tweedy, who found that the congestion at the back of the eyes had lessened, but that the improvement was not sufficient to warrant his resuming work, nor to enable his sight to be corrected by glasses. In this condition the boy still remains, although he has done some 4 months' rest for his eyes. His skin is pallid, but he is not anœmic. He takes plenty of exercise. His appetite is capricious. His urine normal. The case is very instructive in many respects. It shows us that a child brought up under the most favourable surroundings, and with no inherited tendencies, can develop a high degree of short-sightedness simply by using his eyes too much in reading. It teaches us that the first warnings of defective sight must not be allowed to pass unheeded. It teaches us how slow the recovery may be expected to be after a breakdown of this kind.

The next case is that of a bright girl aged 14, who has been working at one of the London High Schools. She also suffers with her eyes, but the defect is of the opposite kind to the one just mentioned. Whilst in the short-sightedness, the eye is too long, so that the light is not focussed on the retina but in front of it; in the opposite condition, which is termed Hypermetropia, the eye is too short, so that the light is not focussed on the retina, but behind it. The latter condition is by far the more common in this country. Like short-sightedness, it is a very frequent cause of headache, and requires correction with glasses. The girl I have mentioned suffers from a high degree of Hypermetropia associated with headache and watering of the eyes. She has worn glasses during the past year to correct her vision, but notwithstanding this she was found to be failing in health, and stoppage of all work became necessary. A rest of several weeks has done much to restore her, and she will shortly return to her school.

In the two cases I have just mentioned, the headaches have been largely dependent upon defective sight. I should remark here that the correction of this defective vision by glasses does not always remove the headaches, though it generally does much to mitigate their severity. In the next case I shall mention severe headaches accompanied by vomiting are of frequent occurrence. Headaches are very common amongst school children, as Crichton Browne showed in his Report; some of them, as we have seen, are associated with defects of vision, others are of the nature of megrim, others depend upon imperfect ventilation or bad feeding, some few are the connecting links to meningitis and inflammation of the brain. Of the latter kind there is some reason to suspect that a boy, whose case I shall briefly describe, is the subject. The patient, aged 10 years, is attending at the Hospital. His father is healthy, but his mother weak. Two children have already died, one at the age of 6, who used to be troubled with frequent attacks of vomiting, and the other at the age of 3, of consumption of the bowels and brain, who also was subject to attacks of vomiting. The patient during the last 5 years had been attending the Board School at Hollington. He is a studious boy and has reached the 4th standard. During the last two years he has been subject to headaches and vomiting, which come on about twice a week and generally last a couple of days, but sometimes they are absent for 2 or 3 weeks. In appearance the boy is tall and slim, with very fair complexion and pale delicate skin. On examining his eyes we found a very slight degree of Hypermetropia, but marked congestion of the optic nerves. The defect in vision is here too slight to account for the headaches, and taking into account the unsatisfactory history, we feel very apprehensive as to the further phases of the case. The next case I shall allude to is that of a little boy aged 9, who is attending as an out-patient at the Hospital with a slight attack of St. Vitus' dance. The movements consist chiefly of twitchings about the eyes, and he has had them about 12 weeks. He has been at school and has reached the 4th standard. Although the case is slight, yet the recovery will be probably very slow, and it is necessary that attendance at school should cease until he is quite well.

I have also just now under observation a studious youth, aged 17, who has a slight degree of Hypermetropia, associated with astigmatism. He has broken down at school, but has not suffered from headaches. The effect with him has been rather that of general bodily debility rather than of any special exhaustion of the brain powers. Rest and open-air exercise are restoring him to health.

The last case to which I shall allude is that of a youth, aged 14, who has been growing very rapidly. He had an attack of inflammation of the lungs. and has been down here to recruit his strength. His case serves to remind one that when the growth is rapid, extreme caution is needed in the oversight of studies.

Having now glanced at cases shewing the connection between education and bodily illness, I wish now to consider whether the methods of study in present use are such as to develop the mind in a healthy way, or whether they tend to subject it to unnatural strain. Does modern education tend to make the average child more intelligent? or more stupid? as one of the teachers consulted by Crichton Browne considered it did in the case of backward children. There is abundant evidence to shew that study, rightly conducted, is good for the health of the brain, just as exercise is for the health of muscle. We find, for instance, many great students live to good old age and enjoy excellent health. They love their work and have found out for themselves something approaching a natural method of study. But the order in which a subject should be unfolded to the child so that it may exercise aright his developing brain powers, is by no means obvious at first sight, and years may yet lapse before people are agreed about it. The Kindergarten system seems to be an admirable one, but as yet it has only been adapted to the requirements of the youngest pupils. But most of the methods of study in use in schools generally are not in accordance with natural laws. Take, for instance, the case of grammar. It will be said that this is necessary for teaching correct speaking and writing. But what is the history of grammar? The Greek classical authors, who for centuries have been considered the best models in poetry and prose, Homer, Æschylus, Plato, had no grammar to guide them, but had messages to tell, and told them carefully. Grammar was invented later on, when rhetoricians and commentators abounded, but divine philosophers and poets had ceased from off the land. Hence I take it, that Nature hints that grammar, if introduced at all, should be introduced late in the school curriculum, after that the pupil by speaking, reading, and writing has attained to some practical acquaintance with language. Ruskin, speaking on this subject, in his lecture on Art, says: "The chief vices of education have arisen from the fallacy of supposing that noble language is a communicable trick of grammar and accent, instead of the careful expression of right thought. All the virtues of language are in themselves moral; it becomes accurate, if the speaker desires to be true; clear, if he speaks with sympathy and a desire to be intelligible; powerful, if he has earnestness; pleasant, if he has a sense of rhythm and order."

And again he says: "Thus the principles of beautiful speech have all been fixed by sincere and kindly speech. On the laws which have been determined by sincerity, false speech, apparently beautiful, may afterwards be constructed; but all such utterance, whether in oration or poetry, is not only without permanent power, but is destructive of the principles it has usurped. So long as no words are uttered but in faithfulness, so long the art of language goes on exalting itself; but the moment it is shaped and chiselled on external principles, it falls into frivolity and perishes. And this truth would long ago have been manifest, had it not been that in periods of advanced academical science, there is always a tendency to deny the sincerity of the first masters of language. Once learn to write gracefully in the manner of an ancient author, and we are apt to think that he also wrote in the manner of someone else. But no noble nor right style was ever yet founded but out of a sincere heart."

Take again the subject of drawing. Herbert Spencer, who observes that the child naturally begins the process of representation by colouring with its paints, says that the hints of Nature here as to the order in which this subject should be taught, are not to be disregarded. The drawing master, on the other hand, will not permit colour to be used until a long dreary course of line drawing has been gone through. But if we enquire how some of the greatest painters have learned their art, what do we find? Here Ruskin helps us again; he says: "For the fact is that while we moderns have always learned or tried to learn to paint by drawing, the ancients learned to draw by painting, or by engraving, more difficult still. The brush was put into their hand whilst they were children, and they were forced to draw with that until, if they used the pen or crayon, they used it either with the lightness of a brush or decision of an engraver. Michael Angelo uses his pen like a chisel, but all of them seem to use it only when they are in the height of their power, and then for rapid notation of thought or for study of models; but never as a practice helping them to paint. Probably exercises of the severest kind were gone through in minute drawing by the apprentices of the Goldsmiths, of which we hear and know little, and which were entirely a matter of course. To these and to the exquisiteness of care and touch developed in working precious metals, may probably be attributed the final triumph of Italian sculpture. Michael Angelo, when a boy, is said to have copied engravings by Schöngauer and others with his pen, in facsimile so true that he could pass his drawings as the originals."

These instances of grammar and drawing might be greatly multiplied, but they are sufficient to show that many subjects of study are presented in an unnatural way. The general effect of this faulty method is to discourage the pupil's efforts, to make him regard study as a hard task instead of an invigorating exercise, to make him dislike it and abandon it altogether when he leaves school, instead of making him feel that he is only just entering upon the enjoyment of a life-long privilege; or, if in spite of faulty methods he has managed to learn something, he is apt to think that information acquired with such effort is of remarkable value, and so he proceeds at once to join the over-swollen ranks of the clerks. I can see but little evidence of a real thirst for knowledge amongst most of those who leave school. It seems to me that there was more of it before education became so general. In support of this view, I may mention a circumstance which occurred in this place a few years back. The Hastings Mechanics' Institution, after having been many years in a state of decay, was broken up, and its collection of philosophical apparatus, consisting of air pumps, electrical machines and jars, sold. Some thirty years ago the youth of the town used to meet there, and lectures were given by some of their number with experiments, for which they had got together a useful set of apparatus. I see no evidence of anything like the same kind of activity at the present time.

Newspapers and political meetings seem sufficient to satisfy all intellectual cravings now. But I hope that the experience of other towns is not quite so bad as this.

Not only must we do away with our faulty methods of treatment of different subjects of study, but much subject matter might be removed with advantage, and more useful matter introduced in its place. For instance, much of what is taught under the name of history simply burdens the memory with a mass of useless statements, which are forgotten as soon as the pupil leaves school. What is instructive or impressive in the record of events, might be introduced into the reading or dictation lesson, and in this way much might be learned without effort. The deeds of great men, such as Columbus, Milton, Newton, Watt, seem to me to form the most valuable part of history; but pupils, as a rule, are taught little about such matters, and their memories are burdened with learning the dates of accession of kings, the names of their wives and children, or the description of battles. Much of the history that is taught produces upon us about the same effect as the account of the Battle of Blenheim upon Wilhelmine and Peterkin.

'It was the English,' Kasper cried,
  'Who put the French to rout;
But what they fought each other for
  I could not well make out.
But everybody said,' quoth he,
'That 'twas a famous victory.'

'Great praise the Duke of Marlbro' won,
  And our good prince Eugene.'
'Why 'twas a very wicked thing!'
  Said little Wilhelmine.
'Nay, nay, my little girl,' quoth he,
'It was a famous victory.'

And everybody praised the Duke
  Who this great fight did win.
'But what good came of it at last?
  Quoth little Peterkin.
'Why that I cannot tell,' said he,
'But 'twas a famous victory.'

And the same objection holds to the present way of teaching of geography. The removal of useless subjects of study would enable us to shorten materially the hours spent in school, and I think there is no doubt that they are too long. Just as in photography, a weak impression is produced by exposing the sensitive plate too long, whereas, a sharp one might have been produced by a shorter exposure, so also is it with the child's attention. I think that anyone who could shorten the school hours would be a great benefactor to education, and I think that not the least among the services rendered to his country by that veteran sanitarian, Sir Edwin Chadwick, whose presence at the Congress has given us so much pleasure, is to be reckoned the half-time system, which he procured for those children who work in factories.

I have been speaking of subjects that could be cut out without loss, and much to the relief of the over-taxed brain of the pupil. I now proceed to consider a subject that should be universally introduced. It is that of *handicraft*. The Jews of old were aware of the importance of this branch of education, and one of their Rabbinical maxims was to the effect that whosoever did not teach his son to use his hands, taught him to be a thief. The Germans, the most learned people of the present day, insist upon its practice, and the late Emperor Frederick was, I think, taught cabinet-making. Our own country has produced its full share of men of the highest order of genius; but, in most instances, on reading their lives, you find that they have owed little to schools or colleges, and that very many of them have been self-taught men. You will find, too, that amongst those eminent in science, most have worked at handicrafts in their youth. I will only instance two names, John Hunter, the founder of scientific surgery, who was apprenticed to a cabinet-maker; and Faraday, the greatest of all the discoverers in electricity, who, as far as I remember, was brought up as a bookbinder. And the connection between their manipulative skill and their power of thought was not accidental. There is an anatomical reason for it. A very important area situated in the frontal and parietal convolutions of the brain, is the centre from which the movements of the hand are directed and controlled. Exercise of its powers promotes the growth of this part of the brain, just as exercising a muscle promotes the growth of the muscle; and on the other hand, neglect of its powers leads to an incomplete development of this important area, and is as disastrous in its consequences as it would be to leave a rich portion of land uncultivated.

A system of handicraft adapted for teaching in schools has been taught with great success in Sweden and Norway. It is known under the name of Slöjd. It is being extensively introduced into other countries, our own being somewhat behind others in taking it up. It aims at the following results: to implant respect and love for work in general, even for the coarser kinds of honest manual work; to foster order, accuracy, cleanliness; to develop the physical powers; to train the eye and the sense of form. It acts indirectly with beneficial effect on the other lessons, for it quickens the intelligence, and causes children to think for themselves. It differs from ordinary carpentry in many respects, its object being to develop general dexterity, and not to teach a special trade; thus, in Slöjd, the knife is the most important tool, and this is little used in ordinary carpentry; it differs in the character of the objects made, which are small, and intended for use at home. The work is executed by free hand, although it includes the making of such articles as spoons and ladles. It is graduated, and proceeds from the easy to the difficult. The pupil is required to produce work not passable but perfectly correct; he must receive no direct help from the teacher's hand, but simply direction and control.

It is found that the best age for beginning Slöjd is about eleven. The results are in every way gratifying. The child takes great delight in his work, and the greatest punishment that can be inflicted on him is to deprive him of his Slöjd lesson. The objects made being for home use, are prized by the child as his own honest work. Amongst the working classes, the actual use of the objects made is of value, and does much to reconcile the parents to their children remaining at school, even when they are able to earn something. In the trades, masters must prefer to take as apprentices, those who have been through the Slöjd course to those who have not.

We hear much about the necessity of introducing technical education into schools. This seems to be a mistaken idea. Schools are not the places for Technical education, any more than for University education. Technical education must be learnt by the apprentice in the workshop, or by the student at the Technical College; but the foundation for technical education should be laid at the school, and the Slöjd course of instruction seems to supply all that is needed for this purpose.

But even if we could introduce into schools such reforms as we might wish for, much would still be required before education would be at all satisfactory. Plato could only discuss the nature of justice by constructing an ideally perfect city or state; and so likewise a good system of education can only be conceived in a rightly-ordered community. Schoolhouses built in open spaces, with the best appliances and methods of teaching, will be of no use to children suffering from starvation or disease. We need, therefore, the help of those who are labouring to prevent or alleviate these deplorable blots on our civilization. Many benevolent people, in despair, have thought that the State will ultimately have to feed the children, if it insists upon their attendance at school. But it is knowledge that is wanted, not the money of the charitable, nor the contributions of the taxpayer. Energetic food reformers, some of whom will address us to-morrow, have, with true missionary zeal, been spreading a knowledge of the nature and properties of food, and of the principles of cookery, throughout the length and breadth of the land. They show that people can live, and live well, at almost less cost than that at which the poorest subsist, even when on the verge of starvation. They show that "'The barrel of meal shall not waste, neither shall the cruse of oil fail." Some think that cookery should be taught to girls in elementary schools, and I see that the Manchester School Board has already introduced its practice. I hope, however, that the zeal and enterprise of the food reformers will come to our aid again here, and render the teaching of cookery in schools unnecessary, by making it possible to be learnt even in the poorest home. The introduction of gas stoves and cheap heating gas, will also, I feel sure, put the practice of cookery upon a new footing, and by rendering it simpler, cleaner, more expeditious, more economical than before, convert into a pleasant task what was formerly a tedious, irksome duty.

The President of the Section, which meets to-morrow, will speak on the prevention of disease, and show us that many of those which are the greatest scourges of school life are preventible. Drainage, fresh air, and sunlight, do much to limit the spread of consumption. It is the children of the consumptive parents who fall victims to the most hopeless of all diseases, meningitis and inflammation of the brain. There are reasons then, for hoping that we have seen the worst of this disease, although, as was said in reference to Crichton Browne's Report, its percentage had increased compared with former years, when education was less widespread.

The President of the Congress, in his brilliant opening address, showed us that sanitation has to do with mind as well as body. The child needs a pure sunny moral atmosphere, as well as a physical one. Many of the cases of overstrain might be put right by firm, but kind moral treatment at home. A too eager desire for success in competition must be checked. The child should be taught to take pride in doing his work honestly, and to refuse to take credit for work ill done. With such a feeling examinations should cause no feverish anxiety; there would be no desire to pass, if the work was not thoroughly done, no desire to be put before another whose work might be much better done. Competitive examinations are credited with doing much harm, and in their present state too often encourage cram, but nothing has been suggested that is likely to be a satisfactory substitute for them. I, however, see no reason myself, why the cram subjects should not be entirely eliminated, and tests substituted, which would try the power and not the forced acquirements of the candidates.

To make our state complete, we must have the surroundings beautiful, we must call in the resources of Art.

Give to barrows, trays, and pans
Grace and glimmer of romance,
Bring the moonlight into noon
Hid in gleaming piles of stone;
On the city's paved street
Plant gardens lined with lilac sweet,
Let spouting fountains cool the air,
Singing in the sun-baked square;
Let statue, picture, park, and hall,
Ballad, flag, and festival,
The past restore, the day adorn,
And make each morrow a new morn.
So shall the drudge in dusty frock
Spy behind the city clock,
Retinues of airy kings,
Skirts of angels, starry wings,
His fathers shining in bright fables,
His children fed at heavenly tables.
'Tis the privilege of Art
Thus to play its cheerful part,
Man in earth to acclimate,
And bend the exile to his fate,
And, moulded of one element
With the days and firmament,
Teach him on these as stairs to climb,
And live on even terms with Time;
Whilst upper life the slender rill
Of human sense doth overfill.

Ladies and gentlemen, my sketchy and fragmentary remarks must now draw to a close. I have endeavoured to show that the serious evils of brain forcing are preventible, and that under the rational system of education, with healthy, physical, and moral surroundings, they will disappear. To bring about this end, we must "Work and despair not."

DISCUSSION.

Sir E. Chadwick said in Germany he had seen the Forces, and generally one-third of them were spectacled. He thought one remedy was to reduce the length of the sustained attention and study. If attention was not sustained by interest in the subject the time was wasted. He thought three hours might be the limit of compulsory attention in elementary schools. He had asked pupil teachers how many of their children could give attention for more than three hours, and they said one-third. The children forgot a large proportion of what was taught them, and in ordinary conversation and occupation forgot the instruction they had received.

Dr. Cook moved a vote of thanks to Dr. Humphreys for his paper, which he said was very instructive, and well worthy of consideration. The first step in a young child's education had to be taken up from the cradle.

Dr. Bender seconded the motion, and said the ancient Jews, however learned they were, always knew a trade. He could fully bear out Dr. Humphreys' remarks, and, as German born, he could say that his bad sight was due to the bad paper on which the German books were published, and the difficult type.

The resolution was carried, and

Dr. Humphreys replied.

Major-General Webber proposed a vote of thanks to Dr. Richardson for Presiding, saying the Congress was a proof of the magnificent success which attended his efforts in connection with sanitation. They were deeply grateful to Dr. Richardson for arranging the Conference.

Mr. Wilson Noble seconded the motion, which was carried and acknowledged.

PHYSICAL CULTURE OF THE YOUNG.

By Miss M. A. CHREIMAN.

PHYSICAL CULTURE, Ladies and Gentlemen, is a large subject to deal with in twenty minutes. Think of its deep interest, its momentous and far-reaching issues, its long neglect; think what unutterable importance attaches to acceptance or rejection of its responsibilities if we consider the unspeakable numbers to be influenced—the People! in their massed millions, in their awful unpreparedness for increase, in the sublime long-suffering of their evil and neglected excess. Think how profoundly necessary to them are knowledge, virtue, health, strength, and happiness; if only to render our social fabric secure; our liberty, law, and religion, truths, not shams.

In a few years our girls and boys of to-day will be the practical rulers and supporters of the Nation, and, as such, influencers of the welfare of the great family of Mankind. Surely their privilege, nay, their birthright, in this age should be guidance and government tending to furtherance of life in all its integrity and completeness; to ascending progress of career by fitness, understanding, and power of self-help; and to passage through honoured and leisured age to holy calm in that death in which "they rest from their labours, and their works do follow them."

But for this, Ladies and Gentlemen, our work is still reform.

I did not enjoy the privilege of attending during the first and second days of this Congress, but I feel sure that much must have been said of the saving advancements with which Science has blessed our age. I wonder whether anyone has taken occasion to point out how greatly the tangible results of theoretic and practical scientific advancements have been hindered and hampered by continuous private indifferences to public health, and by lack of knowledge, personal care, and intelligent co-operation for their own well-being and that of their children, amongst the people at large.

I have watched these impediments long and anxiously, and they have brought me to the conclusion that in respect to advancement of the physical culture of our Youth, our first requirement is the establishment in our schools and colleges of Professors of *Morals.*

To arouse and guide thought, desire, judgment, and self-command, and see that the great principles of right and truth are honoured in all enterprises of education.

To fashion and give impulse to that mightiest moving agency the individual and collective will, and transfer it from the dominion of near and temporary expediencies which hinder by generations the social destinies of humanity, to the liberty of larger law, so that circling the sun of knowledge, it draws not only enlightenment, but warmth of heart and hand to support with radiating sympathy the sublime doctrine of neighbourly love. To render us more patient and receptive of ennobling ideas, less viciously eager in respect of material interests.

Much more, of course, our specialists of morals might do—and amongst the more I would ask:—

That the spirit of manliness so dear to our British Youth be controlled into a factor of influence for Culture, instead of a contingency of peril hostile to Culture. One of the impeding habits of fashion and ignorance is to glorify evil with a good name, and to damn good with an evil name.

Insensibility to the admonitions of pain, contempt of danger, and small regard for life, though sometimes necessary and noble, are oftener selfish and ignoble.

It is not long since our "Manly Sports" included cock and dog fighting, bull-baiting, swearing, betting, and excessive drinking, and it is to be feared that the youthful mind is largely impregnated with the heart-hardening principles of spurious valour, still :—

Next to increased moral teaching, I think that the interest of Physical Culture requires a general manifested recognition of the facts that :—

1.—"Death's consummation crowns completed life or comes too early."

2.—That "The living body is a mechanism, the proper working of which is health; its disturbance, disease; its stoppage, death."

That many of the conditions upon which the activity of this mechanism depends may be definitely modified by our own actions, and that "the business of the hygienist and of the physician is to know the range of these modifiable conditions and how to influence them towards the maintenance of health and the prolongation of life." (*Huxley.*)

3.—And that parents and educators have a like responsibility in the matter.

This bringing of Educational plans and practices into harmony with the teaching of Nature as evidenced in its laws of physiology and psychology, seems to me to be just what so many of our thinkers are feeling the need of at the present time.

It is high time for practical recognition of the fact that all parts of the body, from the enamel of the teeth to the brain, are vital, and must be kept free from disease for the maintenance of that perfect relation and functional action of all the organs of the body which constitutes health—and that some system of test, measurement, and record be generally adopted by which education may be assured against preparing our youth for life, by destruction of life.

I have not time to-day to trace the needs and possibilities of physical culture from the time it should commence (which is, according to Wendell Holmes, a hundred years before birth) through babyhood, childhood, and early adult life—because I want to direct attention to some facts which are antagonistic to culture and to the physical examination of which I have just spoken.

It is to be feared that in the matter of education we are physically in arrears. Not a few of our people still believe that intellectual and spiritual advancement is promoted by degradation of the powers, rights, and interests of the body. Not a few of our people appear to consider that two or three hours or half-hours of bodily exercise weekly (if the exercise be directed by a sufficiently able teacher) is Physical Culture, and a common aim of physical training is to create athletes careless of nerve and limit, and ambitious only of outdoing records of achievement.

Acknowledgment of the physical basis of mental function and the essential unity of body and mind (to which our President has so often called attention—indeed, it is scarcely possible to advance facts of health in Education without going over ground already trodden by Dr. Richardson) will necessarily be a chief factor, in respect to the furtherance of corrective method and design in education.

Understanding is the well-spring of life; more knowledge of the laws of health, growth, and development, is what we want, to give parents and educators the power of estimating the needs of advance, or decline of, and possibilities of Physical Culture; and of bringing those who have the care of our Youth to apprehension of the physical ameliorations and enfranchisements which such culture demands.

It will be well for education, well for the higher and surer direction of its hopes, and for the nobler fulfilment of its ambitions, when a narrow chest and round back, enfeebled lungs or spine, or other low standard of health, is held more discreditable to teachers, parents, and pupils, than failure of examination pass.

When failure to eat or sleep is held more serious than failure to construe the Latin *fuge* or paraphrase the poet's verse.

When growth is protected against the excitants of social, educational, and religious dissipation.

When clothing is adapted to preserve instead of to destroy health, strength, and beauty.

When hours and means of recreation are as strictly regulated as hours and means of study.

When proper air and food supply and right methods of respiration and mastication are the practical business of Mothers.

When the weed and weakness-producing barrenness of the years of girlhood immediately succeeding school life is filled with instruction in the manifold duties of home life, and we have such refined regulation of our delicate domestic machinery, that:—

> If there's a heaven upon earth
> A fellow knows it, when
> He's been away from home a week
> And then got back again.

These are matters of Physical Culture which demand individual and co-operative thought and effort, for loss of musculo-nervous power and loss of symmetry of form are lamentably frequent amongst our girls, and whether this is to continue or be changed will depend upon the attitude and action of parents and educationists.

Deteriorations of physique are not only lamentable from the artistic point of view—weakened nerve means loss of controlling power, and absence of structural completeness means absence of capacity as well as absence of beauty, and these assuredly lessen the sum of life, either in quality or duration. They tend to low vitality in what should be life's period of maturity; to early death, or to that feebleness or deprivation of sense, faculty, and tranquillity which so often makes old age undesirable and undesired, and they are the preparations for and beginnings of diseases which

> "Desperate grown,
> By desperate appliances are relieved,
> Or not at all."

The extension of Physical examinations would do much to lessen the lottery element of health and education.

My usual records are of height, weight, power of respiration, strength of chest, arm, and back, power and equality of vision and hearing, equality or irregularity of growth, harmonic maintenance of physical and mental powers during growth, and customary deportment. Osses-muscular condition of chest, neck, back, and feet. Character and co-ordination of movements. Capability for muscular exertion. Capability for mental work and Iriturcted tendencies to asymmetry or disease.

When Physical Culture is an acknowledged part of Educational work, its classification will be based on some such examination as this. If other gradations of attainment are marked, they should not be of feats of strength, but of ability and interest in securing health; of the increased animation, cheerfulness, receptivity, and power of retention which would assure efficiency to study, and higher order to intellectual life; and of the advance in deportment and manners of grace, gentleness, and affectionate courtesy.

The eye is terribly overworked and wrongly worked, and wrongly worked during the years when it ought to be getting perfected in structure and power; and long sight, short sight, and unequal sight are produced by morbid structural changes. Arrest of structural change may follow its early detection, but restoration of structure is always impossible, and predisposition to the diseased change is almost always transmitted to children.

I have noted several cases of asymmetry of face and neck occasioned by impairments of hearing. Children are often unaware of these defects, and their detection ought to be the business of physical educators. It ought also to be borne in mind that ill-developed jaws and irregular and projecting teeth are often causes of deafness and throat troubles by preventing closure of mouth. Indeed, the importance of sound physical advance of the symmetry and preservation of the teeth is a long subject of itself. Slight degrees of deafness are often the occasion of slow and faulty acquirement of speech in infancy, and of apparent stupidity later.

Long hours of sedentary occupation in bad positions and other one-sided influences are affecting injuriously the form and structure of multitudes of our girls. The beautiful muscular outlines of the neck are damaged; in some the sternoclavical joints become prominent (more rarely unequally prominent). In some I notice greater prominence of one or other collar-bone, due, I suppose, to muscular contraction from sideward carriage of head. Spinal deformity in a minor degree is very common. Narrow chests are eloquent of defective respiration and power of will; and the feet, and their loss of structure and weakness thereby, have only to be seen to be realised.

Health—not strength only—is the concern of Culture, and Physical Educators should be able to detect and explain early changes suggestive of near or remote disease in the individual and her offspring.

Adapted exercise (with good food, good air, plentiful use of soap and water, hopeful work and play), will, of course, do much to avert disease; to restore normal strength and symmetry to enfeebled parts; to slacken the bonds of morbid heredity; to improve the psychical disposition by lessening irritabilities and increasing tranquillity, energy, patience, and power; to "physic pain" and "make good digestion wait on appetite, and health on both."

Culture must develop faculties as well as muscles; must educate hand, and tongue, and eye, and ear to functional rectitude and skill; to appreciation of the varied charms of Nature and of Art—to fitness for the banquet of exalted thought—to power of reception and communication by pen and pencil, poetry, and song of things that energise, exalt, and refine the emotions of men; for "many of the best impulses of the heart are lost in frivolity and sensuality for want of purer beauty to contemplate, and of noble thoughts to associate with the fervour of hallowed human passion."

It is said that up to the 17th Century we Britons were a musical people, that a man who could not sing in a madrigal or canon was regarded with contempt—if so, Physical Culture is very retrograde here, and disuse or very partial use of so mighty a physical moral and intellectual lever is much to be regretted.

Educationists little know how amply enlarged capabilities and durable merit would repay truer cultivation of our youth; and although parents ever aspire to power and happiness for their children, and the aspiration is vigorous, their aims are all ill-defined. But truer Culture must come, unless men and women block the way of the highest truths, and refuse reception to the best of knowledge, and I think that Science will never again stand aside whilst ignorance asserts itself the mother of devotion, the mainstay of morals, the controller of beliefs.

For Culture we must have fair command of time and worthy dominating motives of effort, and, be it remembered, the powerful forces of progress are ever the gentle ones.

The whirlwind and the fire, the noise and dissonance of opposing forces had passed before—mighty in constraining and restraining power; there came the still small voice, in which God was—and so it has been ever since.

To what will the disastrous violence of the competition of one day give place? Will public opinion arrest the Juggernaut, I wonder? As it advances, the strong are not seldom mutilated, the weakly fall and are crushed, or endure "in all the sad variety of pain"—but Society, deafened by the roar and bustle of advancing life, deceived by the quickly-filled gaps in the crowded way—knows not, cares not, whether the fallen and the lost be many or be few. And so, driven by over-mastering ambition, attended too often by avarice, envy, remorse, and fear—the Car rolls on, and even in the sacred domain of Education "man's inhumanity to man, makes countless thousands mourn."

"Let's teach ourselves that honourable stop, not to outsport discretion."

Let us rule mind with temperance.

> "In faith and hope the world will disagree,
> But all mankind's concern is charity;
> Or must be false that thwarts that one great end,
> And all of God that bless mankind or mend."

DISCUSSION.

Sir Edwin Chadwick proposed a vote of thanks to Miss Chreiman, and suggested that the local authorities should get up a class for the Physical Culture of the Young, whereby the advantages of Miss Chreiman's exercises would be seen and illustrated.

Dr. Bagshawe seconded the vote of thanks, and pointed out that the subject had points of interest, both for Educationists and Medical men.

Dr. Humphreys considered that a register of the health and growth of pupils in schools should be universally kept, as it was with regard to hospital patients.

The vote was carried with enthusiasm, and Miss Chreiman briefly returned thanks.

REGISTRATION OF ARCHITECTS.

By EDWARD TIDMAN, C.E., M.S.A.

The Registration of Architects on a similar basis to that now required by the legal, medical, and other professions, is a subject which has become a very important one.

The exceedingly unsatisfactory condition of the structural and sanitary arrangements of dwellings and occupied buildings, has rendered it imperative that some improvement should be made in the designing and carrying out of the work required in their erection, and the incompetence of many Architects, or the non-employment of a competent Architect by speculating builders and others, has tended to continue and increase the sanitary evils which exist at the present day.

Many persons appear to be under the impression that Architects and other branches of the Architectural profession have now to pass an examination before being permitted to practise. I am sorry to say, however, that this is not the case. All that is required to commence business as an Architect and Surveyor is the necessary funds to open an office, buy a brass plate, and be in possession of the necessary amount of nerve to canvass for clients.

It may be said that the public who suffer from the incompetence of some members of the profession are the right parties to agitate for some guarantee of competency, but it seldom happens that what is left to the public (being nobody's business) is carried to a successful issue. Hence it appears to me that the best way of securing the desired improvement would be for one of the many Architectural Associations who are interested in the status of the profession to take the matter in hand.

About thirty years ago the Royal Institute of British Architects, which body should certainly ere this have taken the matter seriously up, passed a resolution to the following effect :—

"The question of instituting an examination has "already been discussed at meetings of this Institute; "and the Council do not profess to do more than "recommend the initiation of a scheme to be cautiously "and gradually developed and brought into working "order; in which too much should not be attempted at "the onset, but which, in accordance with the rule now "established in other professions, the ultimate result "should in their opinion be the establishment of a system "of compulsory examination extended to all the Archi-"tects, whether members or not of this Institute."

The Institute, however, do not appear to have taken any steps to carry out this resolution, except if to oppose a Bill brought in last year to secure the Registration of Architects, Engineers, and Surveyors, may be called so, and from my experience of the Institute, I do not think they are likely to take any immediate steps for the purpose intimated.

Another and much younger Architectural Society, to wit, the Society of Architects, took up the matter three years ago, and a Committee of them was appointed for the purpose of framing an Act, which was drafted and brought into the House of Commons by the late Colonel Duncan. Owing to a series of accidents the Bill was withdrawn, although it met with a great amount of support; but, owing to the absence of its supporters on the day set down for its final reading, by reason of the passing of 17 unopposed Bills in less than as many minutes, Colonel Duncan thought it better to withdraw it than run the risk of having it thrown out. The principal opposition to the Bill of last year was the Engineers' and Surveyors' Associations, and as these professions are now left out of the Bill altogether, they can have no further reasonable ground of opposition. Only four *bona-fide* Architectural Associations in the three kingdoms opposed it, while the following bodies and persons petitioned in its favour:—

Leeds and Yorkshire Society of Architects
Sheffield Society of Architects and Surveyors
South of Ireland Society of Architects and Engineers
Dundee Institute of Architects
York Architectural Association
The Society of Architects
The Council of the Medical Officers of Health Association
The British Medical Association
The British M.A., Southern Branch
The British M.A., East Anglian Branch
The British M.A., South Midland
The British M.A., Southern Branch (2)
The British M.A., South Wales Branch
The Cardiff Medical Society
530 London Medical Practitioners
337 Medical Officers of Health
The Bradford Society of Architects and Surveyors
Architects in Burton-on-Trent, York, Ryde, Cheltenham, Newcastle-on-Tyne, Cork and District, Barnsley, Rochdale, Bristol, Mid-Wales, Torquay, Carnarvon, Hull, Enniskillen, Huddersfield, Members of R.I.B.A. of Windsor, Liverpool, Sunderland, Birmingham, Maidstone, Wrexham, Wigan, Newport, Monmouth, Gloucester, Banbury, Westgate-on-Sea, Jersey.

On the Registration Bill proposed to be brought into the House of Commons this year by Sir Lyon

Playfair,* and in the House of Lords by Lord Herschell, practically the whole of the objections to the 1888 Bill have been met or removed, and hence there is no legitimate reason why the Bill should not become law with little delay, if Parliament can but be prevailed upon to leave its bickering and obstruction, and settle down to pass necessary measures of Domestic Reform.

The following are the leading principles of the Registration Bill, which is to be called the Architects' Act, 1889, and which shall take effect from 1st January, 1890.

A Council shall be established, called the General Council of Architectural Education of the United Kingdom, and shall consist of the following:—

Five persons nominated from time to time by Her Majesty, with the advice of the Privy Council, three of whom shall be nominated for England and Wales, one for Scotland, and one for Ireland

And the Architects chosen from time to time by each of the following bodies:—

Five by the Institute of British Architects, three of whom shall be nominated for England and Wales, one for Scotland, and one for Ireland
One for the Royal Academy of Arts
One for the Institute of Architects, Ireland
Two by the Society of Architects
Two by the Architectural Association and its affiliated Societies
Five by such members of Provincial Societies mentioned in Schedule A of the Bill, as are qualified to register at the date of the passing of the Act, three of whom shall be nominated for England and Wales, one for Ireland, and one for Scotland

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* Since the above was written, Wilson Noble, Esq., M.P. for Hastings, has taken charge of the Bill.

Nine by registered practitioners resident in England, Ireland, and Scotland, respectively, of whom five shall be nominated for England and Wales, two for Scotland, and two for Ireland, in all nine, hereafter referred to as direct representatives

Branch Councils shall be formed in various parts of the United Kingdom, and certain powers delegated by the Council to them

The President shall be a member of all the Branch Councils, and must be qualified to be registered under the Act

Powers are given as to time and place of meeting

The Constitution of the General Council may be revised on application to the Privy Council, such revision shall be laid before the House of Parliament by the Privy Council

The existing Charter of the R.I.B.A. to remain in force

The General Council to appoint a Registrar, and Registrars shall be appointed by the Branch Councils

The Registration fee shall be expended in defraying the expenses in the execution of the Act, and other public purposes connected with Professional Architecture

Accounts shall be published and audited

Clauses are provided describing the qualified persons to be registered

Annual Registration fee shall be paid

Provision is made for the penalty of unregistered persons using the title

Examination shall be held, and evidence of qualification given before Registration

An Annual Register shall be published, called the "Architects' Register"

None but registered persons shall be allowed to recover their charges, or hold public appointments

Privy Council to have power to give directions in case of default of General Council by examining bodies

Schedules to the Acts, giving Forms for Registration and Certificates.

The Medical Profession (who know more of the suffering and loss of life occasioned by badly built and drained houses than anyone else) are almost unanimously in favour of the scheme, and the promoters of the Bill have only met with one medical man who objects to its provisions; but in its favour are, amongst others:—Dr. Cameron, who is of opinion that the Registration of Architects' Bill is entirely on the lines of the Medical, Dental, and Veterinary Surgeons' Acts, which have already been productive of much good results in raising the standard of competency in the profession to which they relate, and he sees no reason why similar legislation extended to Architects should not be productive of equally beneficial results to them and the public, and he hails with satisfaction the movement inaugurated by the Bill Committee, and has hearty sympathy with the object in view.

Sir Joseph Fayrer, M.P., considers the project an excellent one, and merits all the support it can secure. Unsanitary buildings abound everywhere, and the more thoroughly Architects and Sanitary Officers continue to remove these evils, the sooner will the death-rate diminish and the public health be improved and maintained. Special training is needed, and must be insisted on for all who are to have the designing of our houses and public buildings.

Dr. Adams, Medical Officer of Health for Richmond, said "that the defective sanitary arrangements of houses caused more mischief to the inhabitants and more trouble to sanitary officers than any other matters they had to deal with."

Dr. Armstrong, Medical Officer of Health for Newcastle-on-Tyne, is of opinion that a proper Education, Examination, and Legal Certification of Architects is to his mind most imperatively called for in the interest of public health.

Dr. Bond, Medical Officer of Health for Gloucestershire, says that there cannot be any room for doubt that the compulsory Educational Qualification of Architects would be as much to the interest of the profession itself as it certainly would be to the public at large.

Again, Dr. Butterfield, Medical Officer of Health for West Kent District, and formerly Medical Officer of Health for Bradford, says the jerry builders were generally their own Architects. It is in country houses and more especially small villas, that sanitary defects are found. A movement to substitute highly-trained attention tested by stringent examination must result in increased health and comfort to all.

Dr. Braithwaite, Medical Officer of Health for Willesden, is strongly of opinion that it is the duty of the State to see that none but those duly qualified should be empowered to draw plans for any building intended for temporary or permanent occupation of human beings.

I could give you scores of opinions of Medical Men, Officers of Health and Sanitation, in support of the proposed Bill; amongst them:—Dr. J. S. Bristow, of London; Dr. Arthur Downes, Chelmsford; Dr. Farquharson, M.P.; Dr. G. H. Fosbroke, Stratford-on-Avon; Dr. John M. Fox, Warrington; Dr. Alfred Hill, Birmingham; Dr. Mackinder, Gainsborough; Dr. C. C. Paget, Kendal; Dr C. H. Van Parkinson, Wimborne; Dr. George Wilson, Leamington; Dr. W. Robinson, Gateshead; Dr. J. H. Russell, Glasgow; Dr. F. Scott, Edmonton; Dr. Edward Seaton, London; Dr. Joseph Smith, Streatham; Dr. George Turner, Hoddesdon; Dr. H. Welch, Blackpool, and many others.

The evidence of these gentlemen—all, or nearly all of them, holding appointments as Medical Officers of Health, and all eminent in their profession—is a convincing proof to my mind that the Registration of Architects should be no longer delayed; but come when it will, for a time, as in the Medical Act, the Chemists and Druggists and the Dentists Acts, the men in practice at the passing of the Act must be registered as qualified, and the sooner the Bill is passed, the sooner the weeds will die out and be eradicated. I had a curious experience in the North of England some twenty-four or twenty-five years ago, when, holding an appointment as District Surveyor under the Local Government Board, to find practising in a large manufacturing town there as Architects and Surveyors, a shoemaker, a miller's carman, a shipwright, a bricklayer who picked up a smattering of drawing as a private in the Royal Engineers, a Wesleyan Methodist local preacher, and an unsuccessful schoolmaster. I have been somewhat curious to trace the career of these gentlemen. The shoemaker, who dabbled in speculating building and land speculating, has been Chairman of the Local Board of Health, and is now the Vice-Chairman of the Board of Guardians. The miller's man was by turns Gas Account Collector, and afterwards Gas Manager, Local Board and afterwards Borough Surveyor, Agent to the principal landowner, and as such laid out the greater part of a town for 40,000 inhabitants, and eventually was Mayor of the Borough near which he had delivered his flour sacks. The shipwright developed into a successful speculating builder, was appointed to two small Local Boards Surveyorships, and is now Surveyor of a town in the Midlands. The bricklayer tried architecture, speculating building, brickworks management, and the last I heard of him was having a small shop in the grocery line. The Methodist Minister is now the Surveyor to the Rural Sanitary Authority; and the schoolmaster did not succeed so well as Architect as he did as a land speculator and brick manufacturer, and is now, I believe, a commission agent.

With this personal experience in one town only, it appears to me that, taking the country through, there are a number of men who, in the first instance, are utterly incompetent, and who should be prohibited from ruining the health of and killing people by their incompetency and want of knowledge of the first principles of sanitation and of structural work.

It may be said that the Architectural Profession is an Art, and Artists are born, not made; but Art, like everything else, wants practice and experience, and a heaven-born architect is of little use in a practical sense; but where you find a man combining Art with a sound knowledge of construction and sanitation, then to such a man you will entrust the erection of your buildings, the lives of your families and friends; and an Architect with such qualifications will soon rise to the top, and the unqualified, even if good enough to pass an examination, will remain at the bottom; but if examination and certification is insisted on, you will certainly greatly improve the status of the Architectural Profession and the death-rate of the country.

In conclusion, I venture to say that I have fully proved to you the absolute necessity of an Act being specially passed to secure the proper qualification of Architects, and I shall feel much satisfaction if the facts I have laid before you will induce the Congress to pass a resolution in support of the proposed Bill, and I shall be exceedingly gratified to convey such a resolution to the proper quarter.

DISCUSSION.

Dr. Bagshawe declared himself in agreement with Mr. Tidman's views.

Dr. Drysdale asked if a copy of the Bill referred to in Mr. Tidman's paper could be seen.

Mr. Tidman supplied one.

Mr. Wilson Noble thought the Congress might advocate the principle of the Bill, without committing itself to details.

Dr. Gray asserted that it frequently happened that there were medical defects in houses where the builder was his own architect, or the owner followed out his own designs. Would Mr. Tidman's Bill apply in these cases?

The Rev. C. L. Vaughan, of Christ Church, St. Leonards, remarked, that to have a sound mind in a sound body was closely connected with living in a sound house; and this again was connected with having properly trained architects. Formerly, people moved about less, and the skill of any person was pretty well known in his neighbourhood; but in these days of increased locomotion, we required some certitude as to the attainments of strangers who came amongst us, which some such Bill would afford.

Mr. B. A. Ferard was not in favour of enforced registration.

Mr. Rhodes thought that some previous notice of the character of the Bill should have been given.

Sir Edwin Chadwick said that not one in three of London Houses was free from defect.

Mr. Tidman stated that he should be glad if the Congress expressed their agreement with the principle of the Bill.

Dr. Drysdale proposed, and Mr. Hugh Alexander seconded, "That in the opinion of this Congress, it is desirable that Sir Lyon Playfair's Architects' Registration Bill have the early attention of Parliament, and be speedily passed into law." This resolution was carried.

WOMAN'S WORK IN SANITATION,

Presented by the LADY MOUNT TEMPLE and the Committee of the Ladies' Sanitary Association.

In response to a request by the President, the following detail of the work of the Ladies' Sanitary Association is submitted to the Hastings Health Congress. Women's work in life is pre-eminently to influence for good. That they could exercise this power in simple womanly fashion, and help men to promote Sanitary Reform, was the belief which induced a few earnest-minded women in 1857 to form a Society, whose aim should be to popularise and extend sanitary knowledge among all classes, but especially among the poor. This they endeavoured to do by the publication of tracts, the titles of which tell their own tale:—"How to Manage a Baby," "Health of Mothers," "Nursing the Sick," "The Power of Soap and Water," "The Worth of Fresh Air," "The Value of Good Food," "The Use of Warm Clothing," "The Influence of Wholesome Drink," &c. These titles suffice to show the prevalence of the idea that a widespread ignorance existed concerning the Laws of Health, and that much of the debility, disease, and premature mortality in this country could be prevented. It was not easy to take up the Sanitary Crusade against dirt and disease, even so recently as 34 years ago—health was not then the fashionable topic of conversation it is now—and there were trying vicissitudes to pass through, so that at first the acceptance and circulation of these little treatises taxed the ingenuity of many. Health Congresses were unknown then.

But medical men, and other advanced sanitarians, realising the assistance women could give in extending sanitary teaching, were ready to help; and after a time of trial, and the free distribution of these publications to ensure their being even looked at, it became possible to sell them to an ever-increasing public. How changed are the conditions at the present day! What masses of Sanitary Instruction are issued now from the Press, from the handsome volume to the penny Health Lecture, and the sparkling leading article! Yet this Women's Association may claim to have been a pioneer in this new departure of literature, for the tracts have been distributed far and wide—among Clergy of all denominations, Scripture Readers, City Missionaries, and the Colporteurs' Society. Through the agency of Sisters of Mercy, Bible Women, District Visitors, they have reached the poorest and least educated.

Many of the publications have been translated into the German, Dutch, Icelandic, and Welsh tongues; they have been bound together with the religious, temperance, and social tracts, and lent from house to house, and it is a curious and significant fact that the Sanitary Tracts are always the shabbiest and dirtiest when returned, having been read.

With an average yearly income of £350 the Ladies' Sanitary Association has issued over 2,000,000 of Sanitary Tracts, has delivered hundreds of Courses of Lectures on Health, Domestic Economy, Nursing, and Cooking; has formed Branch Associations in many towns; has started the Destitute Children's Dinner Society; has instituted Park Parties, or weekly outings for poor children to the public Parks; has arranged depôts for the loan of cleansing materials, pails, brooms, baths, and patterns of clothing. It has also encouraged window gardening, out-door recreations, gymnastics, and swimming, by the gifts of prizes, and the supply of guides and teachers. There has been no improvement suggested in households that has not had specimens exhibited at the Office, 22, Berners Street, Oxford Street, W., from hygienic boots and clothing, safe swings and perambulators, to filters, wheatmeal bread, and improved saucepans. The latest exhibit being "Corn Coffee," which may prove the coming desideratum as a wholesome refreshing temperance beverage. Indeed, the Office has been a centre for the distribution of facts and information as to the useful work of women in Sanitation, including the subjects of the seats in shops for the tired *employées*, and the Early Closing Movement. The Society has been a nucleus for aiding and developing similar organizations in the Provinces, and it is only necessary to refer to the efforts of the Ladies' Useful Work Association in Birmingham, and the Yorkshire Ladies' Council of Education in Leeds, to prove that groups of women have been working zealously for years in large towns and villages according to their means and local opportunities. By the ready testimony of Corporations and Medical Officers of Health, these feminine efforts have proved acceptable and influential for good to the community. The Association has had enrolled on its member list the names of women who have served their generation by sowing the seeds of knowledge, and recognising in themselves, and on behalf of others, the claims of duty, in the care of health. It would be invidious to name them here, but Florence Nightingale among the living, and Miss Ryland among the dead, have proved how women can help men in sanitary work. In the battle undertaken against dirt, disease, unthrift, intemperance, women have not shrunk from the responsibility of bringing unsavoury facts and insanitary conditions before the Authorities who could redress such evils. And it is a gratifying feature that on no occasion, within the cognizance of the Committee, has it been possible to waive aside such representations as either unfounded or exaggerated; on the contrary, the ills have been recognised, and a modicum redressed.

The Association can confidently appeal to the President as to the desire and readiness of women to be trained to become Teachers of Domestic Sanitation, and to submit the quality of their information to the test of examinations. Dr. Richardson has had very copious proof of this conscientiousness, and as Lecturers on Health, women become increasingly popular.

There exist grave sanitary moral questions in which women feel the deepest interest, and in the solution of which they hope to share. As a rule, women wish to do thoroughly and promptly what they undertake, and are, perhaps, the less tolerant of vested interests, licences, bye-laws and regulations, lack of precedents, etc. Indeed, sometimes they think patient endurance is not *always* a virtue. At any rate, there is abundant evidence of their "Sister Anne" like disposition to look towards and to watch for ameliorations, whether these take the form of food supply, house accommodation, or street cleansings. They cordially welcome all that may serve to develop Home and Home Life for the people, and show that they are not unwilling to take up any share in the work that can be appropriately allotted to them. That there is a woman's part to be filled up in the National House-keeping seems to be allowed, and it may be safely assumed that most men can recall from their personal experiences the name of at least one woman who has rendered good service in Sanitary work as medical women on Boards of Guardians, in Workhouses and Hospitals, and in Public and Private Institutions. What women have done, women can do; and there are, happily, now ever-enlarging opportunities of acquiring the training needful to make women the efficient helpers they would gladly be to those who are marching with themselves along the arduous path of life. In our Prisons and Reformatories, in our Infirmaries and Asylums, and particularly in Educational Establishments, there is a field for women to work in, a true Mission Service mapped out for them in Sanitation, which they could fill with advantage to themselves and to inmates. Men go straight on at a difficulty or obstacle; women have a useful tendency to look right and left, around, and into corners. This habit has proved, and generally does prove, useful in Sanitary work. There have been instances known to the Committee where abuses have been discovered and wrongs righted by a searching and detailed feminine observation which the more heroic method of work had left unseen and unredressed. Looking around, therefore, from the standpoint that the past experience of the Ladies' Sanitary Association yields of what women have been able to do, and realising thankfully the increased opportunities the present time affords for training them for future work, it may be assumed that women, having done what they could to help men in promoting Sanitary Reform, will continue to do so, and, with the increasing light shining daily more clearly, go on in this matter of duty and become yearly better help-meets for man.

Mrs. Jameson's words ably describe this state of things so earnestly desired—"all our endowments for social good, whatever their special purpose or denomination — educational, sanitary, charitable, penal — will prosper and fulfil their objects in so far as we carry out the principle of combining, in due proportions, the masculine and feminine element; and will fail or become perverted into some form of evil, in so far as we neglect or ignore it."

A SANITARY CLOAK

TO BE

WORN AT FUNERAL RITES.

THOMAS TWINING, Esq., of Twickenham, exhibited a cloak for use at funeral rites. He explained, in a short note addressed to the President, that for many years past he had been impressed with the conviction of the danger to health occasioned by the attendance of gentlemen bare-headed and imperfectly protected from cold at funerals during inclement weather. He had, therefore, invented a cloak with a hood attached, which afforded perfect protection to the wearer, and which might be worn both by the mourners and by the officiating clergy. The cloaks were made so as to be befitting the occasion, and were constructed of materials of different values, so as to bring them within the reach of all classes of the community.

ON PURIFICATION OF AIR BY OZONE,

WITH AN ACCOUNT OF A NEW METHOD.

By BENJAMIN WARD RICHARDSON,
M.D., F.R.S.

DURING the time when I was engaged in my preliminary medical studies—for I never admit to this day of being anything less than a medical student—the substance called ozone became the topic of much conversation and speculation. I cannot say that ozone was a discovery of that date, for in the early part of the century Von Marum had observed that when electrical discharges were made through oxygen in a glass cylinder inverted over water, the water rose in the cylinder as if something had either been taken away from the gas, or as if the gas itself had been condensed, and was therefore occupying a smaller space. It had also been observed by many electricians that during a passage of the electric spark through air or oxygen, there was a peculiar emanation or odour which some compared to fresh sea air, others to the air after a thunderstorm, when the sky has become very clear, the firmament blue, and the stars, if visible, extremely bright.

But it was not until the time, or about the time, of which I have spoken (1846-49), that these discovered but unexplained phenomena received proper recognition. The distinguished physicist Schönbein first, if I may so say, isolated the substance which yielded the phenomena, and gave to it the name by which it has been since generally known, of ozone, which means, to emit an odour; a name, I have always thought, not particularly happy, but which has become, practically, so fully recognised and understood, that it would be wrong now to disturb it.

Schönbein made ozone by the action of the electric spark on oxygen. He collected it, he tested its chemical properties, he announced it to be oxygen in a modified form, and he traced its action as an active oxidiser of various substances, and especially of organic substances, even when they were in a state of decomposition.

But Schönbein went further than this. He argued that ozone was a natural part of the atmosphere, and that in places where there was no decomposition, that is to say, in places away from great towns, ozone was present. On the high tower of a cathedral in a big city, he discovered ozone; in the city, at the foot of the tower, he found no ozone at the same time. He argued, therefore, that the ozone above was used up in purifying the town below, and so suggested quite a new explanation of the purification of air.

The subject was very soon taken up by English observers, and I remember well a lecture upon it by Michael Faraday, in which that illustrious philosopher, confirming Schönbein, stated, that he had discovered ozone freely on the Brighton Downs, and had found the evidence of it diminishing as he approached Brighton, until it was lost altogether in the town itself.

Such was the beginning of our knowledge of ozone, the precise nature of which has not yet been completely made out. At the present time it is held to be oxygen condensed. To use a chemical phrase, the molecule of oxygen, which in the ordinary state is composed of two atoms, is condensed in ozone as three atoms. By the electric spark discharged in dry oxygen as much as 15 per cent may, under proper conditions, be turned into ozone. Ozone has also been found to be heavier than air. Professor Zinno says, that compared with an equal volume of air its density is equal to 1658; and that it is forty-eight times heavier than hydrogen. Heat decomposes it; at the temperature of boiling water it begins to decompose. In water it is much less soluble than oxygen, and indeed is practically insoluble; when made to bubble through boiling water it ceases to be ozone. The oxidising power of ozone is very much greater than that of oxygen, and, according to Saret, when ozone is decomposed, one part of it enters into combination, the other remains simply as oxygen. It is remarkable that some substances, like turpentine and cinnamon, absorb ozone and combine with it,—a simple fact of much greater importance than has ever been attached to it. I found, for instance, that cinnamon which, by exposure to the air has been made odourless and, as it is said, spoiled, can be made to re-absorb ozone and gain a kind of freshness, and it is certain that many substances which are supposed to have disinfecting properties, owe what virtues they possess to the presence of ozone.

On some grand scale ozone is formed in the air, and my former friend and colleague, the late Dr. Moffatt, of Hawarden, with whom I wrote a paper on Meteorology and Disease, read before the Epidemiological Society in 1852-3, described what he designated ozone periods of the atmosphere, connecting these with storms. When the atmospheric pressure is decreasing, when with that there is increasing warmth and moisture, and when south and south-westerly winds prevail, then ozone is active; but when the atmospheric pressure is increasing, when the air is becoming dry and cold, and north and north-easterly winds prevail, then the presence of ozone is less active. These facts have also been put in another way, namely, that the maximum period of ozone occurs when there is greatest evaporation of water from the earth, and the minimum when there is greatest condensation of water on the earth; a theory which tallies well with the idea that ozone is most present when electricity is being produced, least present when electricity is in smallest quantity. Mr. Buchan, reporting on the observations of the Scottish Meteorological Society, records that ozone is most abundant from February to June, when the average amount is 6·0; and least from July to January, when the average is 5·7; the maximum, 6·2, being reached in May, and the minimum, 5·3, in November. This same excellent observer states "that ozone is more abundant on the sea coast than inland; in the west than the east of Great Britain; in elevated than in low situations; with south-west than with north-east winds; in the country than in towns; and on the windward than the leeward side of towns."

Recently a very singular hypothesis has been broached in regard to the blue colour of the firmament and ozone. It has been observed that when a tube is filled with ozone the light transmitted through it is of a blue colour; from which fact it is assumed that the blue colour of the sky is due to the presence of this body in the higher atmospheric strata. The hypothesis is in entire accord with the suggestion of Professor Dove, to which Moffatt always paid the greatest respect, viz., that the source of ozone for the whole of the planet is equatorial, and that the point of development of ozone is where the terrestrial atmosphere, raised to its highest altitude at the equator, expands out north and south in opposite directions towards the two poles, to return to the equator over the earth as the trade winds.

It is necessary for all who would understand the applications of ozone for any purpose, whether for bleaching purposes or pure chemical purposes, or for medical or sanitary purposes, to understand these preliminary facts concerning it, facts which bring me to the particular point to which I wish to refer to-day.

In my essay describing the model city Hygeiopolis, it was suggested that in every town there should be a building like a gas-house, in which ozone should be made and stored, and in which it should be dispensed to every street or house at pleasure. This suggestion was made as the final result of observations which had been going on since I first began to work at the subject in 1852. It occurred to me from the moment when I first made ozone from Schönbein's method, that the value of it in a hygienic point of view was incalculable. To my then young and enthusiastic mind it seemed that in ozone we had a means of stopping all putrefaction, of destroying all infectious substances, and of actually commanding and destroying the causes which produce the great spreading diseases; and although increase of years and greater experience have toned down the enthusiasm, I still believe that here one of the most useful fields for investigation remains almost unexplored. In my first experiments I subjected decomposing blood to ozone, and found that the products of decomposition were instantly destroyed, and that the fluid was rendered odourless and sweet. I discovered that the red corpuscles of fresh blood decomposed ozone, and that coagulated blood underwent a degree of solution through its action. I put dead birds and pieces of animal substances that had undergone extreme decomposition, into atmospheres containing ozone, and observed the rapidity with which the products of decomposition were neutralised and rendered harmless. I employed ozone medicinally, by having it inhaled by persons who were suffering from fœtor of the breath, and with remarkable success, and I began to employ it and have employed it ever since (that is to say, for thirty-seven years), for purposes of disinfection and deodorization, as in close rooms, closets, and the like. I should have used it much more largely but for one circumstance, namely, the almost impracticable difficulty of making it with sufficient ease and in sufficient quantities to meet the necessities of sanitary practice. We are often obstructed in this way. We know of something exceedingly useful, but we cannot utilise it. This was the case with ozone. I hope now that difficulty is overcome. If it is, we shall start from this day on a new era in regard to ozone as an instrument of sanitation.

As we have seen, ozone was originally made by charging dry oxygen or common dry air with electricity from sparks or points. Afterwards Faraday showed that it could be made by holding a warm glass rod in vapour of ether. Again he showed that it could be made by passing air over bright phosphorus half immersed in water.

Then Siemens modified the electric process by inventing his well-known ozone tube, which consists of a wide glass tube coated with tinfoil on its outside, and holding within it a smaller glass tube coated with tinfoil on its surface. When a current of dry air or oxygen was passed in current between these two tubes, and the electric spark from a Ruhmkorf coil was discharged by the terminal wires connected with the tinfoil surfaces, ozone was freely produced, and this was no doubt the best method, for by means of a double-acting hand bellows currents of ozone could be driven over very freely. One of these tubes with hand bellows attached, which I have had in use for twenty-four years, is before the meeting, and answers as well as ever. The practical difficulty lies in the requirements of a battery, a large coil and a separate bellows as well as the tube.

My dear and most distinguished friend, the late Professor Polli, of Milan, tried to overcome the difficulties arising from the use of the coil by making ozone chemically, namely, by the decomposition of permanganate of potassa with strong sulphuric acid. He placed the permanganate in glass vessels, moistened it gradually with the acid, and then allowed the ozone, which is formed, to diffuse into the air. In this way he endeavoured, as I had done, to purify the air of rooms, especially those vitiated by the breaths of many people. When he visited me, not very long before his death, he was enthusiastic as to the success that must attend the utilization of ozone for purification, and when I expressed a practical doubt, he rallied me by saying I must not desert my own child. At the theatre La Scala, on the occasion of an unusually full attendance, Polli had collected the condensible part of the exhaled organic matter, by means of a large glass bell filled with ice and placed over the circular opening in the roof, which corresponds with the large central light. The deposit on this bell was liquid and had a mouldy smell; was for some few days limpid, but then became very thick and had a nauseous odour; when mixed with a solution of one part of glucose to four parts of water, and kept at a temperature of from 20deg. to 24deg. C., this liquid underwent a slow fermentation with the formation on the superficies of green must; during the same period of time, and placed under the same conditions, a similar glucose solution underwent no change whatever.

By the use of his ozone bottles Polli believed that he had supplied a means most suitable for directly destroying in the air miasmatic principles, without otherwise interfering with the respiratory functions. The ozonised air had neither a powerful nor an offensive smell, and it might be easily and economically made. The smell of ozone was scarcely perceptible, and was far less disagreeable than chlorine, bromine, and iodine, while it was more efficacious than either of these; if, therefore, its application as a purifier of vitiated air succeeded, it will probably supply all the exigencies of defective ventilation in crowded atmospheres. In confined places vessels might be placed containing mixtures of permanganate of potassa or soda and acid in proper quantities, and of which the duration of the action was known, or sulphuric acid could be dropped upon the permanganate.

This idea of applying ozone is no doubt very ingenious, and in the bottles before us on the table, which have been prepared in St. Leonards by Mr. Rossiter, we see it in operation. The disadvantages to the plan are that manipulation with strong sulphuric acid is never an agreeable or safe process, and that the ozone evolved cannot be on a large scale without considerable trouble.

In 1875 Dr. Lender published a process for the production of ozone. In this process he used equal parts of manganese, permanganate of potash, and oxalic acid. When this mixture is placed in contact with water ozone is quickly generated. For a room of medium size two spoonsful of this powder, placed in a dish and occasionally diluted with water, would be sufficient. As the ozone is developed, it disinfects the surrounding air without producing cough.

Lender's process is very useful when ozone is wanted on a limited scale. We have some of it here prepared by Mr. Rossiter, and it answers exceedingly well, but it would be impossible to generate sufficient by this plan for the large application that would be required should it come into general use. The process deserves to be remembered, and the physician may find it valuable as a means by which ozone may be medically applied to wounds, or by inhalation when there are fœtid exhalations from the mouth or nostrils.

A NEW METHOD.

For the past ten or fifteen years the manufacture of ozone, for the reasons related above, has remained in abeyance, and it is to a new mode, which will, I trust, mark another stage of advancement, that I now wish to direct your attention. Two years since, Mr. Wimshurst, a most able electrician, invented the electrical machine which goes by his name. The machine, as will be seen from the specimen of it on the table, looks something like the old electrical machine, but differs in that there is no friction, and that the plates of glass with their metal sectors, separated a little distance from each other, revolve when the handle of the machine is turned in opposite directions. The machine, when it is in good working order (and it is very easily kept in good working order), produces electricity abundantly, and in working it I observed that ozone was so freely generated, and more than once the air of my laboratory became charged with ozone to an oppressive degree. The fact led me to use this machine for the production of ozone on a large scale, in the following way.

From the terminals of the machine two wires are carried, and are conducted by their terminals to an ozone generator formed somewhat after the manner of Siemens, but with this difference, that the discharge is made through a series of fine points within the cylinders. The machine is placed on a table with the ozone generator at the back of it, and can be so arranged that with the turning of the handle which works the machine a blast of air is carried through the generator. Thus by one action electricity is generated, sparks are discharged in the ozone generator, air is driven through, and ozone is delivered over freely.

If it be wished to use pure oxygen instead of common air, nothing more is required than to use compressed oxygen and to allow a gentle current to pass through the ozone generator in place of air. For this purpose Brin's compressed oxygen is the purest and best; but for ordinary service atmospheric air is sufficient.

The advantages of this apparatus are as follows:—

1.—With care it is always ready for use, and as no battery is required, nor anything more than the turning of a handle, any person can work it.

2.—It can be readily moved about from one part of a room or ward to another.

3.—If required for the sick, it can be wheeled near the bedside, and, by a tube, the ozone it emits can be brought into action in any way desired by the physician.

I refer in the above to the minor uses of ozone by this method, but I should add that it admits of application on a much grander scale. It would now be quite easy in any public institution to have a room in which a large compound Wimshurst could be worked with a gas engine, and from which, with the additional apparatus named, ozone could be distributed at pleasure into any part of the building. On a still larger scale ozone could be supplied to towns by this method, as suggested in Hygeiopolis, the model city.

It will occur, I doubt not, to the learned President of this Section, and to others of our common profession, that care will have to be taken in the application of ozone that it be used with discretion. This is true. It has been observed in regard to diseases, that in the presence of some diseases ozone is absent in the atmosphere, but that with other diseases ozone is present in abundance. During epidemics of cholera ozone is at a minimum. During other epidemics, like influenza, it has been at a maximum. In our paper

Dr. Moffatt and I classified diseases under both conditions, and the difference must never be forgotten, since in some diseases we might, by the use of ozone, do mischief instead of good. Moreover, as my published experiments have shown, prolonged inhalation of ozone produces headache, coryza, soreness of the eyes, soreness of the throat, general malaise, and all the symptoms of severe influenza cold. Warm-blooded animals also exposed to it in full charge suffer from congestion of the lungs, which may prove rapidly fatal. With care, however, these dangers are easily avoided, the point of practice being never to charge the air with ozone too abundantly or too long.

A simple test affords good evidence as to the presence of ozone. If into twenty ounces of water there be put one ounce of starch and forty grains of potassium iodide, and the whole be boiled together, a starch will be made which can be used as a test for ozone. If ozone be passed through this starch, the potassium is oxidised, and the iodine, set free, strikes a blue colour with the starch. Or bibulous paper can be dipped in the starch, dried and cut into slips, and these slips being placed in the air will indicate when ozone is present and free. In disinfecting or purifying the air of a room with ozone, there is no occasion to stop until the test paper shows that the ozone has done its work of destroying the organic matter which is the cause of impurity or danger. For my own part, I have never seen the slightest risk from the use of ozone in an impure air. The difficulty has always been to obtain sufficient ozone to remove the impurity, and it is this difficulty which I hope now to have conquered.

VOTE OF THANKS.

Mr. T. H. Cole proposed a vote of thanks to Dr. Richardson for his able Lecture on the Purification of Air by Ozone, explaining that the late hour at which the morning proceedings had terminated, precluded the offer of this well-earned compliment at the conclusion of the Lecture. He paid a tribute to the many-sided character of Dr. Richardson, his powers of organisation shewn in the great success of the Congress and Exhibition, the eloquence and poetry of his opening address, his position amongst his medical brethren, and to-day his proofs of the practicability of purifying the air of our cities by the ingenious and most successful experiments we had witnessed.

Dr. Haward seconded the motion, which was carried with great enthusiasm.

VEGETARIANISM IN RELATION TO HEALTH.

BY

JOSEPH KNIGHT, *Secretary of The Vegetarian Society.*

My object in this paper will be to show that the practice of Vegetarianism, when judiciously entered upon, is not only compatible with the maintenance of health, but may also be a factor in its improvement. It is unfortunately too true that there exists a strong necessity both for conserving and augmenting the general standard of health. The tendency to deterioration demands that attention be given to the conservation of such measure of health as may be possessed; while its low average standard equally claims attention for the purpose of improvement. The influence of diet, for good or for ill, is acknowledged by a large proportion of the laity, as well as by the medical profession, and it is from those who realize the potency of food as an operating agent in the matter of health, that the Vegetarian question will receive such candid enquiry as must set at rest all doubt as to the soundness of its basis, notwithstanding that considerable difference of opinion may exist in regard to the detailed dietaries that may be included in its superstructure.

The basis referred to is a simple one, and negative in character; and this basis alone is the essential feature of Vegetarianism. It is the non-use of animal food, or, stated more explicitly, the non-use of any food which has possessed animal life. On the other side, there remain for the use of the Vegetarian, at individual discretion, all other varieties of food from every source of supply. The vegetable kingdom furnishes all its food products in their great and beautiful varieties, and with their wondrous adaptation to the numerous and variable needs of man. The mineral kingdom gives such food products as are found in it—but these, if we exclude water, are perhaps more in the nature of food accessories than of actual foods. And the animal kingdom supplies such of its food products as are yielded without the loss or destruction of animal life. In selecting from these supplies there is complete freedom to take or to leave, to use or not use, any individual product, or even the whole of the products, from any of the three sources. Thus we are again brought back to the one main principle of Vegetarianism—abstinence from animal food. It may not be out of place here to remark that, apparently for the sake of convenience, the originators of the word Vegetarianism distinguished between the two sections of supply from the animal kingdom, by designating as *animal products* those foods which are *permissible* to Vegetarians—not having possessed animal life—the other section, that which is *excluded* from the Vegetarian dietary being termed *animal food.*

It will be readily seen how great a variation in the construction of dietaries is possible under the Vegetarian system. And it is equally true under this, as under the ordinary mixed dietary (using this term in its generally accepted sense, to indicate a dietary of which animal flesh forms a part), that a wrong selection and combination of foods cannot give the same happy results as a wisely chosen and properly arranged dietary, and may give rise to serious ill consequences. But, apart from such untoward experiences, we may gather from the testimony of those who have resorted to Vegetarianism, that the change of diet has proved in many cases decidedly advantageous. And in the experience of life-Vegetarians we find evidence of the sufficiency of their diet for maintaining good physical condition. The evidence, too, has relation to both sexes, to adults and children, to the healthy and the sickly, to mental workers and manual workers, to "all sorts and conditions of men."

The following extracts afford a few examples of testimony on the subject:—

Its benefits to the sickly, and its value to manual workers, are shown by Mr. Thomas Mansell, a foreman at the Thames Iron Works, London. He says:—

> The first thing that influenced me in the direction of Vegetarianism, was the beneficial effect which Vegetarianism produced on my wife's health. She had long been a sufferer from varicose veins as well as from another and more serious disease; and had it not been for her trying Vegetarianism, I believe she would have died. The results of the change of diet became evident at once, and she now enjoys health. . . . . I thought it was right for me to give Vegetarianism a trial. I maintained my health and strength on the new diet. . . . . I believe a Vegetarian diet gives the constitution more resisting power, more "stamina," as people say, than the ordinary diet. I have enjoyed better health, for instance, than my brothers and sisters, who have kept to the latter. . . . . You all know what "puddling" in an ironworks means, and what hard work it is. Well, we have "puddlers" in London who are Vegetarians. We have "shinglers," too, whose work is almost as hard, working upon a Vegetarian diet. We have "moulders" also, who are Vegetarians. We may well maintain that our system is adapted to hard manual labour, I think, when we find puddlers, shinglers, moulders, forgemen, blacksmiths, engineers, and platers living well, and doing their work well, upon a Vegetarian diet. . . . When I took fleshmeat I used to suffer severely from indigestion, but since I became a Vegetarian, now thirteen years ago, I have not suffered from indigestion any more. I have maintained my strength, and can do my work to-day far better than I could when I took a mixed diet. A change from the ordinary mixed diet to Vegetarianism gives one the ability to do the same amount of work, and that with less fatigue than formerly.—*Vegetarian Messenger*, October, 1888, p. 312.

Again, Mr. R. Jeffery, of the same works, said:—

> He was a working man, and had to work very hard. He found from experience that he was better, and could do his work better than on a flesh diet. He did not start Vegetarianism when he was an invalid; he started it when he was well, but as a Vegetarian he was still better.—*Vegetarian Messenger*, November, 1887, p. 372.

By mental workers equally forcible testimony is given. A letter to the *Times* from Mr. Isaac Pitman early in 1879 contains a statement as to his dietetic experience, an experience confirmed by an article in the

Pall Mall Gazette for March 7th, 1889, after the lapse of a further decade. In 1879 he writes:—

> About forty years ago dyspepsia was carrying me to the grave. Medical advisers recommended animal food three times a day instead of once, and a glass of wine. On the regimen I was nothing bettered, but rather grew worse. I avoided the meat and the wine, gradually recovered my digestive power, and have never since known, by any pain, that I have a stomach. These forty years have been spent in continuous labour in connection with the invention and propagation of my system of phonetic shorthand and phonetic spelling, correspondence, and the editorial duties of my weekly journal. . . . . I attribute my health and power of endurance to abstinence from fleshmeat and alcoholic drinks. I can come to no other conclusion when I see the effect of such extended hours of labour on other men who eat meat and drink wine or beer.—*Vegetarian Messenger*, May, 1887, p. 151.

And in August, 1887, speaking at a meeting in Manchester, he said:—

> At the age of seventy-four I am healthy and active, mainly by adopting a vegetarian diet when I was a young man of twenty-five. —*Vegetarian Messenger*, October, 1887, p. 328.

Professor F. W. Newman has now been a Vegetarian more than twenty one years. After ten years experience, he records:—

> My digestion was always painful *until I became a Vegetarian ten years ago*. . . . . I regard abstinence from fleshmeat as an advantage to an intellectual and sedentary person scarcely inferior to abstinence from wine, ale, &c.—*Vegetarian Messenger*, December, 1887, p. 398.

The Rev. Prof. John E. B. Mayor, after making a severe trial of Vegetarianism, says:—

> It left me convinced that fleshmeat is entirely unnecessary for health and strength. I feel bound to make this conviction known to others, who now sacrifice health and comfort to the supposed necessity of supplying their families, out of limited means, with butchers' meat.—*Almonds and Raisins*, 1888, p. 8.

Mr. William E. A. Axon, than whom none have perhaps more severely tested the sufficiency of a Vegetarian diet to support mental work, addressing a meeting in Manchester, said:—

> He could not claim to have done any great amount of hand work in his time, but he thought that during the twenty-one years that he had been a Vegetarian he had done as much brain work as

had ever fallen to individuals of his constitution and strength; and he could certainly say of it that he did not believe that, with the claims upon his time and his strength of an exacting profession, he could without the help of Vegetarianism have given such an amount of labour to public work as he had been able to do in that, his native city. He was speaking there before many who knew him intimately, and they knew that what he said was not exaggeration, and if it was not for the testimony to Vegetarianism not a word about it would escape his lips. He could speak also from his own particular point of view of individual benefit gained from the Vegetarian system.—*Vegetarian Messenger*, November, 1887, p. 375.

For testimony touching the influence of the diet upon life Vegetarians, we may listen to the Rev. James Clark, after about 35 years experience of the system:—

He had tried it in the bringing up of a family; and he was glad to say he had half a dozen sons and daughters who had never tasted animal food. He had also already three grandchildren who were being brought up in the same way. He mentioned those facts to show that when his children left the family roof and made a home for themselves, they showed their appreciation of the system in which they had been brought up by continuing its use. . . . . He had had the great advantage of having a Vegetarian wife, who had been a Vegetarian all her life, whose mother was a Vegetarian all her life, and whose father was a Vegetarian for above 40 years, her grandfather being also a Vegetarian for above 40 years. . . . It was possible for him to show the fifth generation of Vegetarians thriving and doing well. . . . . In addition to his duties as a minister, he was a member of the Salford School Board and Chairman of the Board of Guardians, to all of which capacities he gave up a large amount of time. . . . . He did not think that was a very bad state of things to be in when one was getting on to sixty years of age.—*Vegetarian Messenger*, June, 1887, p. 171.

And the usefulness of the dietary to children might be judged from a letter written by Mr. J. W. C. Fegan, of the Boy's Home, Southwark, London. In this he writes:—

Our system—for after three years' trial we can hardly continue the term experiment—of non-flesh diet has proved so successful that we never think for a moment of going back to the old regime. I am sure that if wisely and thoughtfully introduced into any institution for young people it will be found of advantage, both physically and morally. We have never had anything like such good health before as in the last three years. Our medical officer has almost a sinecure—this is wonderful, considering the stock and antecedents of our boys.—*Vegetarian Messenger*, October, 1888, p. 311.

This, then, is practical evidence, and if we appeal to the realms of theory it certainly appears reasonable that good results should follow the use of a Vegetarian dietary, and that fear of injury is groundless if common care be used in the choice and preparation of the foods. For if the teachings of science be considered, we see that from vegetable growths all animal frames are formed, and that the food products of the vegetable kingdom contain all the elements required for supplying the needs of the human body. Albuminoids for building up and for repairing waste of tissue; carbon compounds for furnishing heat and force; mineral matters for the osseous structures and other requirements; and water—generally in a pure, one might almost say in a naturally distilled condition. And, as one advantage possessed by vegetable foods over animal flesh, I think I am correct in stating that of the two sections of carbonaceous substances—the carbo-hydrates and the fats and oils—the one which is admitted to be required in larger proportion than the other (viz., carbo-hydrates) is practically absent from animal flesh. The deficiency has to be made good by the combination of vegetable with animal foods. But a Vegetarian dietary needs not to be supplemented with animal flesh, having no chemical lack to make up.

Again, the digestion of animal food being almost entirely performed in the stomach, instead of being fairly distributed over the different portions of the digestive tract, not only throws upon the much-abused stomach an excess of labour, but leaves other organs with an insufficiency of employment. Does it not seem probable that this interference with the natural balance of work of different portions of a mechanism so complex as the human body, and the stimulation produced thereby, may, through the course of many generations, have produced a condition of the digestive function which is calculated to be inimical to the highest physical welfare of the body generally? And this stimulative action is additional to such stimulating properties as may be contained in animal flesh.

From these and other considerations, I cannot avoid the conclusion that the flesh of animals is not a natural food for man. And inferences drawn from analogy point in the same direction. In man the anatomical conformations and physiological operations are more closely allied to those of the anthropoid apes, a frugivorous class of animals, than to those of either the herbivora or carnivora. Whether the arrangements of the stomach, the extent and character of the intestinal canal, the action of the skin with respect to sweating, the motion of the jaws, the arrangement and formation of the teeth, or the character of the hands or claws be considered, there appears to be an absence of resemblance between man and the carnivora; while there are many points of similarity between man and the frugivorous apes. The most frequent and popular reason put forth for considering man carnivorous is that he possesses what are termed "canine" teeth. I am unable to agree with those who hold that the human cuspids are *tearing* teeth. But such examination as I have so far been able to make, leads me to the conclusion that these teeth are far less prominent in man than in monkeys, while in relative size and prominence, correspondence to each other in the two jaws, and position as compared with other teeth, they are altogether different from those in the true carnivora. Is it not, then, a misnomer to refer to them as "canine" teeth, seeing they are so unlike the teeth of the dog?

Again, it may be argued that even supposing animal flesh is not naturally a food for man, that it is not a food for which he was originally *adapted*, yet his wonderful *adaptability* has enabled him through long ages to use such food, and that he has thus modified his nature. But, if so, at what expense? Notwithstanding all the sanitary and other improvements that have been made, there is still a lamentably large number of early deaths, and a vast amount of sickness and feebleness. The causes of this condition are many and various, but not improbably one of the prime factors is an erroneous dietary. And may it not be possible that one of the most important errors, perhaps the foundation mistake, consists in the use of an unnatural food in the form of animal flesh? Even had we to consider only the use of flesh from animals in good health, there seems sufficient reason for pressing the enquiry, but when it is remembered how great a majority of animals that are slaughtered for food are in a more or less diseased condition, the question assumes intensified importance. And that seriously diseased flesh is sometimes sold and eaten no one can doubt in the face of our newspaper records. The consumption of four joints from animals affected with disease for every one joint from a healthy animal is not a pleasing prospect. Yet it may fairly be assumed that this is the average risk run by the English flesh-eater, this assumption being based upon the evidence of an Inspector of the Metropolitan Meat Market, as mentioned by Dr. A. Carpenter before a meeting of the Sanitary Congress, that 80 per cent. of the animals slaughtered for the market were more or less diseased. Indeed, for the bulk of the population the risk may be even worse, for the great care exercised in the exclusion of any diseased carcases from the Jewish meat market must of necessity add to the proportion of diseased animals consumed by the Gentile populace.

Although the use of such diseased food must be prejudicial, it appears after all to be but an aggravation of prior mischief. For it is admitted that certain effete and injurious matters, decayed and decaying tissue cells in process of transition to the various excretory organs, are inseparable from the flesh of even the healthiest animals, the process of elimination being arrested at death. They are, therefore, consumed by the eaters of flesh food, and produce a stimulating effect. And it seems not unreasonable to suppose that, in addition to the recognised stimulating properties of these effete excrementitious particles, their habitual ingestion, by charging the blood with morbid matters, may tend to reduce the disease-resisting power of the body, and also to bring it into a greater or lesser degree of fitness for the reception and cultivation of any malady by which it may be attacked? And, conversely, a diminution in the frequency and severity of attacks of gout, rheumatism, and kindred diseases, in the case of those who have abandoned the use of animal food; the comparative immunity—even under circumstances favourable to their development—from these and other diseases arising from a wrong state of the blood, which is enjoyed by many Vegetarians; their lessened liability to dyspepsia, to the contracting of colds, to irritability, to toothache, to inebriety, and to other serious or trivial derangements, seem to indicate that their power of resistance is increased, or that their bodies prove a less suitable soil for the establishment and growth of disease. Or, not unlikely, the two conditions may operate in combination. Is it not, then, probable that this advantage is due to the absence of those morbific substances which the flesh-eater cannot avoid taking into the system?

Allowing, then, that such benefits have been and are being derived by some who have been for different periods accustomed to the use of animal food, and who have abandoned it and adopted a Vegetarian diet, how much more decided and permanent might we fairly anticipate would be the benefit realised after the lapse of a few generations of general and habitual Vegetarian practice! It is a common experience, not only in relation to food, but also to other habits of life, that a change from one habit to another that is better is often followed by a period of disturbance, more or less marked according to the extent of the change, the duration of the first habit, or other circumstances. And only when the body has become accustomed to the better, and has overcome, at least in some measure, the condition induced by the worse habit, are the beneficial effects realised, and the looked for improvement established. Now I am disposed to think that what is thus observed in the individual would be equally the case with a country or nation, or with a succession of generations. Presuming that this is so, we might expect that if during many generations some injurious habit had been practised, the substitution for it of a better habit would probably result in various disturbing experiences during the immediately succeeding generations. But when this transition period had passed the full value of the change would be realised by the later generations. Similarly, a national practice of detrimental character being abandoned in favour of another in itself good, might result in disturbances until the members of the community or the body politic had become accustomed to the new and improved conditions. On this hypothesis it may be assumed that a full realisation of the benefits of Vegetarianism cannot be obtained until the practice has very greatly extended, and been continued for a sufficient period and on a sufficiently wide scale for a tolerably complete transition to be effected from the effects of flesh-eating. But taking an illustration from the experience of individual Vegetarians, what a bright future that would be! Clearer intellects, purer blood, stronger muscles, healthier bodies, would be general possessions. For it is frequently testified by Vegetarians that their entrance into the practice is attended with unpleasant features. A feeling of weakness; a depletion of corporeal bulk with decrease in the weight; a sense of being unsatisfied; a faint or "used-up" feeling, and other symptoms are by no means rare in the experience of the tyro in Vegetarianism, while occasionally more alarming troubles accompany the change of diet. Usually these are merely results of an unwise selection of foods, and may be speedily remedied on rectification of the error. Often they arise only from fancy, but in some cases they are apparently due directly to the change from a mixed to a Vegetarian diet, from an inferior to a superior regime. But in the majority of cases a wise perseverance produces marked improvement upon the condition which prevailed anterior to the change of dietary.

Among other health advantages of Vegetarianism are those which arise through the pocket and the conscience. To bring these two—apparently so diverse in character—into juxtaposition may seem strange, yet they both converge to one centre in their influence upon mental anxiety. The effects of worry are often in themselves more serious than those of disease, and frequently also worry leads directly or indirectly to sickness, and unfitness for the duties of life. A Vegetarian dietary is much less costly than a mixed dietary provided on a similar scale, and in many instances the knowledge of this fact, and the application of that knowledge in practice, would save much anxiety as to "ways and means," especially for the heads of families. Such knowledge, however, to be effectively applied needs to be accompanied by a knowledge of the dietetic value of foods, and this the spread of Vegetarianism is helping to disseminate.

One of the strongest arguments against flesh-eating, and therefore in favour of Vegetarianism, is that which which appeals to the higher sentiments, the unselfish impulses, the better nature of man. How many are constantly chiding themselves on account of the sufferings of the non-human species, the horrors which are so intimately connected with the animal food supply. For evidence of this, we need only remember the discussions which have taken place in the endeavour to secure a less cruel method of taking the life of animals for food. It is needless to enter into this question at any length; the concomitants of the rearing, transit, and slaughter of animals are sufficiently well-known. But to such as feel strongly upon this subject, the acquirement of information by which they learn of the non-necessity for such food often comes as a great relief. Instead of being compelled to crush down the thoughts that would sometimes arise respecting the food they were taking, or by the depressing influence of their thoughts, and the non-enjoyment of the food to lose the benefits which under happier conditions they would derive from it; the conscience is at ease, there is a satisfaction in knowing that not for supplying their meal has any needless cruelty been perpetrated or suffering endured, and the thoughts that arise about the food they are eating can be freely permitted. Not alone is the better digestion of food advantageous, but the mental quietude and restfulness arising from the consciousness that their practice is in harmony with the promptings of conscience, are of the highest value in promoting physical health.

When we consider the conditions of life at the present time, we are forced to recognise that they are generally conditions of high pressure. Although the causes of this state of things are numerous and complex, it is evident that the use of stimulating foods and drinks has an influence in it. The high pressure craves stimulant, the stimulant encourages the high pressure, and thus the two act and re-act on each other. One result or accompaniment of this is the multiplication of wants, which have grown to such an extent that retrenchment and reform are loudly called for. Where can they begin better than at the table, by the disuse of that section of food which, while being the most costly, has been shown by science and experience to be unnecessary?

What the result would be on the increase of population cannot very well be asserted. Different views are held on this point, both among Vegetarians and non-Vegetarians. But there seem to be many reasons for the opinion that the disciples of Malthus should hail with pleasure the spread of Vegetarianism, while those, if there be any, who are anxious that the Registrar-General should return a high birth-rate, and who care not what may be the reverse side of the picture, would be justified in looking with very doubtful eyes upon an accession to the number of intelligent Vegetarians. It is generally held that the higher the scale of life, the smaller, as a rule, is the proportional reproduction, and *vice versa*. In regard to human kind, it appears that among the more intellectual, refined, gentle, and cultivated, the average family is smaller than among the coarser, ruder, more animalised section. And this seems to apply equally to all classes in the social scale, the rule being, like all other rules, subject to exceptions.

In the avoidance of gross foods, an important step is taken in checking or reducing grossness of body.

Undoubtedly there is much of grossness in animal flesh, and especially in some of the forms in which it is used, *e.g.*, game, the viscera of various animals, birds, &c., and many minced and prepared foods of the sausage tribe. And so extensively are the latter articles now used, that, not inaptly, this has been termed the "sausage-eating generation." Animal flesh is not only gross, but is also stimulating. In abstinence from stimulating, exciting food, a feverish condition of body is not fostered, and the passional nature becomes less difficult to control.

One feature of the flesh-eating system is the constant exposure to view of the carcases, or portions of carcases of slain animals. If it be true not only that,

> "A thing of beauty is a joy for ever,"

but also that the common acquaintance with sights of beauty and sounds of sweetness, has a refining influence, what must be thought of the educational tendency of the sights and sounds connected with the procurement, supply, and preparation of animal food? Is there room for doubt that the tendency is the opposite of refining? On the other hand, the avoidance of these sights and sounds by the discontinuance of the system which gives them birth, must necessarily have an elevating influence.

With the disuse of animal food there will be found a change of occupation for that large class of men who are at present vicariously engaged in the work of butchering; taking the lives of animals on behalf of those whose innate tenderness recoils from a task so degrading, so brutalising, so repulsive to all the noblest instincts and sentiments of man as the slaughter of innocent victims. And others who are engaged in the rearing, transit, &c., of animals for the food market, and in trades connected with this branch of food supply will also find other and less demoralising employment. It needs no words from me to make it clear that the work of slaughter is brutalising. This is manifested very distinctly in an extract from the report of an inspection of private slaughter-houses, quoted in the paper on "The

Abattoir System," written by Mr. H. F. Lester, Hon. Sec. of the London Model Abbattoir Society, and yesterday laid before the Congress. It would be hard to find a more forcible example of callous indifference to the sufferings of animals than that which becomes evident when the full purport of this report is realised. Let me remind you of the words, which refer to one of the slaughtering places inspected: "Large place with side entrance. Very bad approach, down a slippery asphalte incline, ending in two stone steps. Two lairs; in one the animals could not see into the slaughter-house, in the other they could. Here sheep were being killed, having previously—as the butchers informed us—been kept in the lair for three days. No utensils for feeding or watering the animals. Butchers took about a dozen sheep out of the lair, and huddled them in a corner of the slaughter-house while others were being killed. Butchers were men and boys, two of whom were apparently got in for an odd job." Think of it! Three days in confinement without any proper arrangement for food or water, so that if food were given it would presumably be thrown on the floor, and the unsanitary state of that floor imagination may serve to indicate. Then for this period of three days to witness the slaughter of their fellows, to hear their pitiful bleating and dying cries, to be in constant terror of the moment when the knife, which they could see being used to slaughter others, would be turned upon them. Such sufferings must certainly bring them into an unhealthy condition and consequent unfitness for human food. But one can scarcely conceive the possibility of human beings becoming so insensible to the sufferings of animals as is indicated by this wanton infliction of exquisite torture, truly the refinement of cruelty. To quote from Mr. Lester, and substituting "a partial" for "the," it may be true that a partial "remedy for all these evils lies in the establishment of abattoirs, or public slaughter-houses, and the adoption of better modes of killing." And we can but be glad that the attention now being given to this matter is having an ameliorating influence. But I may be permitted to suggest that "*the* remedy for all these evils lies in the" discontinuance of that system of food supply which brought them into existence and still maintains them, "and the adoption of better modes of" dieting. While on this subject I would like to say how gratifying it is, and what an evidence it gives of the attention that is now being accorded to the Vegetarian question, when a gentleman in the position of Mr. Lester hints in such significant words at the possibility of inquiring "whether the supposed difficulty of maintaining our bodily strength without partaking of such nutriment is real or imaginary; whether as we are usually taught at an early period of our existence, oxen and sheep were created in order to be converted into beef and mutton, or whether the meat-eating habits of society are not a gigantic and ruinous mistake."

Then, too, the substitution of the juices of "the kindly fruits of the earth," for the emanations from the fruits of the shambles, will help to keep in a pure and healthful condition the blood of the user, and tend to the building up of sounder tissue more capable of enduring the wear and tear of life, and better able to withstand both the onslaught of disease and the ravages of time. On this point we may find much that is instructive in the records given by travellers of the healthy condition, the great strength, the fine physique, the longevity of some races of people by whom the flesh of animals is rarely, if ever, eaten. But I do not place too much reliance upon a comparison of one nation or class with another. It is difficult to find correspondences or even close approximations in all other conditions than that of food, or to make due allowance for the variation of such other conditions, and without this the comparison loses much of its value, and is apt to be misleading. But so far as it is possible to judge by other nations, there is strong suggestiveness that a Vegetarian diet tends to healthful and long life, and that the use of flesh food is favourable rather to rapidity of the processes of life and to the shortening of its duration.

Again, the increasing demand for fruits and other products of the earth, and the reduction in the number of cattle, would on the one hand require, and on the other set at liberty, much of the land that is at present used as pasture. And here would be found the needed employment for butchers, drovers, the unemployed, and others, who, being drafted from our overcrowded cities where they are not wanted, where for many of them good health is simply an impossibility, and where their conditions and surroundings too often debase them not only below the level of a man, but beneath that of the brute; and being placed in the country where they would be wanted, and where health would be their normal condition, would make life easier for those still remaining in the towns. Less keen for them would then be the struggle for existence, and with brighter prospects, more cheerful hopes, and wider "breathing space" and "elbow room," a higher standard of health would be realised. Then those both in town and country, being also less worn with anxiety, would be more likely to remember that

> "The mind's the measure of the man,"

and to aim to increase their stature upon this principle.

Such results, however gradual, would prove an important step in the direction of making the people of this country a thrifty, intelligent, and contented people, who would probably then give more care to the *rearing* of their offspring, their number at the same time being in many cases diminished.

Presuming these prognostications to be correct, a change in the population may be expected to follow the wider adoption of Vegetarianism. And the change which it appears most reasonable to anticipate would be an *increase* in the standing population and a *decrease* in the floating population. Started on life's voyage with better constitutions, and furnished with more appropriate food than in far too many instances is at present obtained—either through lack of means or want of knowledge—what more probable than that the span of life would generally be of a more natural length, thus increasing the "standing population." The same causes would surely diminish premature deaths, while generally improved physical and mental conditions would contribute to better, and doubtless also to fewer births. Thus would the "floating population," of which the present terrible infant mortality is so alarming a feature—be decreased.

"Utopia?" I think not. At any rate, experience thus far is so satisfactory as to justify and encourage further experiment. I do not claim for Vegetarianism more than its right place. It cannot undo the ill results of inattention to the conditions of health in other respects, nor prevent the due consequences of the violation of natural law. It cannot obliterate the influence of other demoralising and deteriorating conditions and surroundings. Pure air, exercise, rest, cleanliness, surroundings of beauty in some shape—whether, for example, they take the form of the cheap print, of which, perhaps, a thousand may be produced in a day, or of the noble painting, the one production of highest talent devoted to it for a series of years—matters so beautifully referred to in the delightful paper read by Mr. Wyke Bayliss before the Congress this morning; these and many other things equally with right food are factors in health. But the converse is also true, and I ask for Vegetarianism the same candid and impartial consideration that is given to sanitation, the abatement of noxious vapours, the purification of air and water and kindred matters, the extension of which, conjointly with Vegetarianism, may give to some future generations the good health which the present generation seeks in vain.

That Vegetarianism deserves such consideration will be freely admitted. Its claims are so many and so varied that they must appeal to all who possess thoughtful minds. Its humanity and justice to the races of animals subject to man; its value as an auxiliary to the work of temperance reform; its influence—direct and indirect—upon the character; its aid in substituting healthful and humanising employment for that which is unwholesome and degrading; its adaptation to the physical requirements, and its harmony with the structure and functions of man; the chemical accuracy of the foods found in the vegetable kingdom; its reduction of the risks of disease, and benefit in promoting health; its economy and consequent service in enabling all to be fed with a sufficiency of nourishing food; its value to the owners and occupiers of land, and to those who might find employment thereon in exchange for present idleness; the removal from woman's work of many unpleasant and even revolting details that are inseparable from the preparation of animal food; the enjoyableness of the diet; the generally elevating, refining, ennobling influence which may be expected to accompany or follow its wider adoption; and its influence in adding to the sum, not only of human health, but of human happiness and usefulness. These and other considerations justify the appeal which is made to you for a fair and full examination of the principles of Vegetarianism.

* * *

MIXED DIET.

By CHARLES R. DRYSDALE, M.D.

Senior Physician to the Metropolitan Hospital of London.

I HAVE noticed, with solicitude and regret, of late years a tendency in some of the very most esteemed authorities in hygienic science and in political economy to coquette and dally too much with those innovators who style themselves "food reformers" or "vegetarians."

It appears to me that the proposition that mankind should live exclusively on cereals, fruits, and vegetables—the contention of the vegetarian—is the most heterodox of all doctrines, and that it is totally opposed to the well-being of the race and the prospects of civilisation. The precepts of the Brahmins have been vegetarian in their tendency, and the population of Hindostan has doubtless been much damaged by the teachings of its priests. None but the lowest castes in Hindostan will partake of the flesh of cattle or sheep. It would appear that in this country also there are numbers of persons who desire to imitate these religionists of India, and to abjure entirely the use of fish, flesh, and fowl. Such persons allege that man, like the anthropoid apes, is naturally a frugivorous animal; and hence, that he is in error when he imitates the habits of the carnivora. Besides which, they argue that it is a cruel practice to make use of innocent animals for diet, such as the domestic animals or poultry, although some "food reformers," curiously enough, do not feel the same objection to killing and eating fish. The most telling of the arguments against animal diet is, perhaps, the one which alleges, with truth, that several diseases are communicated to the human race by the use of the flesh of animals similarly affected. Lastly, one strong argument for abandoning animal food is that, if this were done, a much larger number of persons might be fed than are at present fed upon a mixed diet. All these arguments should be seriously weighed and carefully discussed. Well, in the first place, if experience be appealed to, it will be found that the human race from the most remote ages has made use of animal food. Not to speak of the Homeric banquets, when the heroes of Ancient Greece feasted on the flesh of fat oxen, the remnants of pre-historic man, as found among the lake dwellers in Scotland, Switzerland, &c., show that animal diet was eagerly sought after tens of thousands of years ago; and, at the present day even, there are large numbers of the human race, dwellers in Lapland and northern Siberia, who are necessarily carnivorous in their diet, since no kind of digestible vegetable product grows in their frozen native lands. And yet, according to the Swedish navigator Nordenskiold, these poor people live a most healthy life, nearly exempt from many of the diseases which occur in countries which consume much vegetable food. Sir Francis Head, in his account of life in the Pampas of South America, says that the power of endurance of those persons who live exclusively on meat and water is quite incredible; and whenever comparative experiments have been made as to the efficiency of labourers living on animal diet and vegetables compared with that of labourers living wholly or nearly without animal diet, the result has been to show the great superiority of mixed diet. Thus Dr. Meinert (Armée and Volks Ernährung, Berlin, 1880, vol. 2, p. 177) relates the case of some English and French workmen employed in iron works in France. The English, it was found, could do far more work, as they consumed much animal food, whilst the Frenchman lived chiefly on soup, bread, and vegetables. This was attended to, and the diet of the French being altered to one containing much animal food, they were enabled to equal the English workman. The same fact was noticed when the Rouen railway was in course of construction, and also when the French assisted in the construction of the Spanish railways.

Cuvier, in his "Regne Animal," was one of those who maintained that man was naturally frugivorous; but Professor Virchow (Nahrungs-mittel, 1872) truly observes that history shows that the highest performances of the race are effected by nations who use mixed diet. Dr. Livingstone showed that even in hot climates, man cannot with impunity confine himself to vegetable diet (Last Journal, London, 1874, vol. 2, sec. 320), and observes that those negro tribes who lived almost exclusively on vegetables were quite incapable of great fatigue or of withstanding the dangers of the climate, as compared with the tribes that reared and eat cattle. Dr. Wernich (*Zeitsch*, für Biol., vol. xv, sec. 197) says that the Japanese exhibit great bodily weakness and are of small stature; and that their diet, chiefly rice boiled in water, is the cause of this. England, it has often been said, could never govern Hindostan, were the natives of that country not rendered apathetic and effeminate by their vegetable diet. Professor Bouchardat, of Paris, used to say that the efficiency of a nation might be guaged by the amount of meat consumed per head. One writer, Professor Gobin (Des Produits Alimentaires, p. 194), estimated the amount of beef, mutton, pork, goat-flesh, poultry, game, and fish, consumed in England at 47,000 kilos per annum, against 31,000 kilos in France, 18,000 in Germany, 15,000 in Austria, 12,000 in Spain, and 10,000 in Italy. Of late years it has been said that the consumption of meat per head in this country is about 114 pounds, against 26 pounds in Italy.

With regard to the argument of Cuvier, that man is more allied to the herbivora than the carnivora, it must be mentioned that in the sheep the length of intestines is 28 times that of the body, whilst in the carnivora the intestines are but three times the length of the body. In man, the length of the intestines is six times that of the body, or much more like those of the carnivora than the herbivora. Man, again, has teeth which seem to fit him for either frugivorous, herbivorous, or carnivorous habits. Lastly, the weight of the intestines in herbivorous animals is from 15 to 20 per cent. of the weight of the body; in carnivora, 5 to 6 per cent.; and in man from 7 to 8 per cent. of the body weight. So far as these facts go, we may place man far nearer the carnivora than the herbivora.

One of the most powerful arguments against the use of animal food is the humanitarian one. But, if neither sheep, oxen, nor other domestic animals were used for food, these animals would of course cease to exist, as they now do in European countries, and this would surely not be for the happiness of such sentient beings. If the animals used by man for food were but painlessly killed, their life would be an enviable one as compared with the life of many human beings; and painless slaughter of animals is now made perfectly feasible, as shown by Dr. B. W. Richardson, by means of electricity. So that the humane argument is really one which is by no means clear. Nor is it evident that nations that live mainly on vegetable food are more free from cruelty. The reverse might be said, for the Chinese and Hindoos have been by no means less cruel than the inhabitants of Europe, indeed, their ferocity is notoriously great when excited.

As to the accusation against the use of animal food, that it is apt to promote diseases of a virulent character, such as glanders, tapeworms, anthrax, or tuberculosis, this is certainly a very important point; and one which should be far more attended to than has been the case hitherto. But, it must be remembered, that several diseases among plants are dangerous to man, such as the ergot which attacks the rye, and the parasite of the maize, which causes a fatal disease *pellagra* in the north of Italy. If our slaughter houses were carefully watched, and all diseased animals at once pronounced to be unfit for human food, it would be easy to get rid of this reproach, as indeed is the case in the practice of the Jews in London and elsewhere, who carefully inspect the cattle, sheep, and other animals offered as food supplies. This possibly may be the reason why Jews in London are said more rarely to die from pulmonary consumption.

The main error in the theory of diet which has infested the writings of most "food reformers" and Vegetarians seems to have had its' origin in the statement made by Justus Von Liebig (Chemical Letters, 1851,) where he alleged that the albumen and fats derived from the vegetable kingdom were equally nutritious with those obtained from the animal kingdom. Liebig assumed that where an equal amount of nitrogen existed in vegetable food, an equal quantity of digestible albumen was obtainable. But, during the last twenty years, this hypothesis has been shown to be quite untrue; and, as a general rule, it may be said, that the albumen of meat is far more assimilable than that of vegetables. Experiments made by the hundreds, of late years, principally in Germany, have proved that the daily amount of albumen taken by grown up males should be about 4¼ozs. with 3 and one-fifth ozs. of fat, and about 12 ounces of starch. If less labour is performed, of course, less food is needed; and if more is performed, more food is required. The normal temperature of man being 98½deg. Fah., it is found that the above-mentioned quantities of food, if burnt in a calorimeter, would be such as would keep the body up to that temperature. It has been alleged, every now and then, that the human being does not require nearly so much nitrogen as the above-mentioned quantity; but it may be laid down as a law, without any exception, that a normal human being cannot exist without a fixed quantity of albumen, which must be increased according to the greater mechanical work to be performed. Compare, for instance, the diet of an English workman on the Rouen Line, mentioned by Payen, who consumed no less than 199 grammes of albumen, 22 grammes of fat, and 815 grammes of hydro-carbons daily, with Ritter von Schertzer's account of the diet of the Chinese labourer, which contains only 68 grammes of albumen, 3 grammes of fat, and 704 of hydro-carbons daily; and we may understand how much less mechanical work could be performed by such a Chinese than by such an English labourer. It is this miserable diet which makes it so dangerous to admit the Chinese into our colonies. To compete with such labourers, the standard of comfort of the nations of the west would soon be lowered to starvation point. It would be a death-blow to the intelligence and energy of England, were the diet of the working man in this country made to resemble that of the Chinese or Japanese. In this country, the diet in prisons is now somewhat ameliorated, and hence our prisoners retain their health; but in Germany and other countries on the Continent, the vegetarian tendencies of some legislators have caused a great deal of mortality from insufficient diet. Dr. Meinert (op. cit.) mentions the case of a prison at Agram, where the poor prisoners received only 81 grammes of albumen, 19 grammes of fat, and 416 of hydro-carbons, and where they suffered terribly from scurvy. Except on Sunday, vegetable diet alone was given. Playfair showed that the amount per cent. of nitrogen and carbon in the muscles and blood of oxen was identical. Hence we may say, that any diet is valuable in proportion as it contains animal albumen in it. It is not sufficient to ascertain the quantity of nitrogen which any article of diet contains, in order to appreciate its worth as a nutrient, since many nitrogenous bodies are not albumen at all, and cannot be digested, and we have no right to represent different kinds of albumen as being equivalent in nutrition. Thus, if we were to attempt to obtain all our albumen from potatoes, few persons have good enough digestive powers to consume the quantity required. And so with many other vegetable foods. Dr. Rubner (neber die Ausnutzung emiger nahrungs mittel, *Zeitsch*, f. Biol., 1879) gives a table in which he shows that when meat was eaten, only 2·5 per cent. of the nitrogen contained in it was found in the solid excreta, the rest having passed through the blood, and being found in the fluid excreta. This, he says, is equivalent to the complete digestion of the albumen of meat. The nitrogen of cheese and eggs was equally well digested, whereas that of milk gave from 7 to 8 per cent. of undigested nitrogen. In macaroni, 17 per cent. of the nitrogen was not digested; 19 per cent. of that of white bread; 15 per cent. of maize; 25 per cent. of the nitrogen in rice was not digested. In peas, from 28 to 17 per cent. of the nitrogen was undigested; and 32 per cent. of that of black bread; 32 per cent. of that of potatoes and 39 per cent. of the nitrogen of yellow turnips. In the case of a man experimented on by Rubner, who eat 207 grammes of lentils, 1000 grammes of potatoes, and 40 of bread, no less than 47 per cent. of the nitrogen swallowed was not digested. Hence vegetable diet is only of so much use to a man as he can digest it; it often causes great distension of the stomach, as in the case of the poor Irish and others who live almost entirely on potatoes. A curious fact was found in the experiments of some German chemists, and that is that the albumen of whole lentils when cooked is most indigestible, but that as much as 93 per cent. of the nitrogen of lentil flour was digested. Hence, if people will be vegetarians, they should improve upon the wily pilgrim's plan and grind their peas as well as boil them. Much has been said in praise of whole meal and black and brown bread; but the experiments I have cited seem to show that the more carefully the flour is separated from its envelopes, the more digestible is its albumen. The presence of bran, as in the case of the German black bread called *pumpernickel*, tends to cause a certain portion of the nitrogen to escape undigested.

The main reason that the well-to-do classes live so much longer than the poor is, that they have plenty of nourishing and digestible animal food. Thus, the average age at death among the nobility, gentry, and professional classes in this country at present is about 59 years, whereas among the artizans in Lambeth (Chadwick and Richardson) it does not exceed 30 years. The poorer classes, being more instinctive, increase very rapidly, and press heavily on the food supplies, whereas the richer classes increase slowly and thus can get plenty of meat and proper nourishment. Thus the birth-rate in Kensington parish, London, in 1888, was 19·5 per 1000 inhabitants, as against 47·9 per 1000 in

Fulham, a district of London peopled by poor market gardeners. The main difficulty in modern civilisation is to procure sufficient supplies of animal food for our poorest classes, who have often to work so hard on scanty and non-nutritious food. About a million of persons are said to have died in Ireland of typhus fever in the years of the potato famine. Mortality and crime have usually been found to rise when the price of wheat rises, because then the price of all other necessaries of life rises also. It is therefore a most dangerous thing to endeavour to make up for the albumen of meat by giving nominally equivalent quantities of vegetable albumen, and many poor prisoners have been done to death from this error in theory.

To sum up this question of diet, it may be said that vegetable diet is less useful than mixed diet because:—

1.—It contains a relatively smaller quantity of albumen. On this account a large part of vegetable albumen is not digested by man; and this is apt to cause indigestion and imperfect utilization of the food.

2.—The amount of vegetable food when taken alone requires to be far greater than when animal food is added, and this is apt to produce difficulty. This is the reason why persons who live almost exclusively on vegetable diet are liable to contract severe and obstinate diseases of the intestines, and, as a consequence of this, their muscles are liable to become less nourished, and their tissues more watery. This condition often leads to inefficiency and listlessness, whilst the liability to become attacked by other diseases, such as typhus fever and consumption, is apparently increased. Hence, the real diet for all civilisation is the mixed one, where most of the nitrogen is derived from animal products, whilst the carbon is derived from the vegetable kingdom: and the pure vegetarian is an enthusiast who would, if listened to, inflict the very worst and least reparable of evils on civilisation.

DISCUSSION.

Sir Edwin Chadwick said that soldiers sent to prison were reduced to a vegetable diet, and were found to benefit by it when their health was compared with their usual diet.

Mr. Frank P. Doremus advocated a vegetable diet. He had had a considerable experience, and a varied one, and could say that for the twelve years he had been a Vegetarian he had been better in health, heavier in pocket, and he also thought better mentally. As to their being heterodox, he thought, on the contrary, they were the orthodox, for the peoples whose food was chiefly Vegetarian, the Hindoos and the Chinese, outnumbered all the other peoples of the globe. He instanced many nations living entirely upon vegetables, with the most satisfactory results.

Professor André said he would like to invite Dr. Drysdale to the Continent, where he would prove to him that he was entirely wrong. His (the Professor's) experience amongst the people of various nations had been that Vegetarianism was really to their benefit.

Dr. Watters, who had given Vegetarianism a good trial, spoke of the large amount of diseased meat which was sold as being against the mixed form of diet. For himself, a vegetable diet entirely agreed with him. He had ridden a bicycle from Folkestone to Torquay without animal food or alcohol.

Dr. Haward said it occurred to him that the argument had been based upon the two extremes, and, as in many other subjects, he thought the real truth was to be found between the two.

Dr. Richardson said Dr. Drysdale was wrong, as he himself had once been in the measurement of the testinal canal. On the other side, they should not take to vegetable food merely on the question of teeth, because the latter were entirely regulated by the class of diet. He differed from the Vegetarians on one point: he saw, and most medical men saw, how that some people could not live on vegetables only. His tendencies were, however, a little towards the Vegetarian side, although he himself was not one of their number. His sympathies also were with them.

THE HEALTH OF THE BODY.

CONCLUDING ADDRESS,

BY THE PRESIDENT,

BENJAMIN WARD RICHARDSON, M.D., F.R.S.

MAN AND A STEAM ENGINE—A WORKING COMPARISON.

Dr. Richardson opened his lecture by narrating a conversation he had once held with an engineer on the qualities and merits of a factory steam engine which the engineer worked, and which, after outliving, at work, three generations of engineers, was still as ready for work as ever, and might easily outlive three generations more. He questioned his informant as to the mode of life of his predecessors at the work, and gathered that it was a careless mode, a prolonged insanitary condition in which they wore out their days and nights wastefully, and which afforded ample reason why they had lived such short careers. He compared their careless existence with that of the engine they had tended, and which, because it was kept in the most perfect state of cleanliness and purity, was beating its masters so completely in the race of years. From this, he (the lecturer), would take his text about the health of the body, for the body was an engine, and, if kept as orderly and cleanly as the steam engine, would show a far better endurance than is common to its fate. The comparisons between an engine and the body were then made by means of a diagram; both require food and drink, both require air, both produce similar products of combustion, both have a certain portion of ashes of their food as waste, both require a certain definite temperature at which to work, and both produce a measure of work, proportionate to the food and air, which they take in and utilise. So far the analogy is complete, but the engine falls short of the animal body in that it is made by a man, and when it is out of repair must be repaired by a man; whereas the animal body rebuilds and repairs itself. The engine burns its fuel for motion, and produces motion; the animal body burns, moves, and builds its own parts. The engine, again, is incapable of taking in impressions from the outer universe; the animal body is gifted with the power of taking in such impressions, of fixing them, and of giving them back to the world. Finally, the animal body is endowed with volition, with will to do and perform work as it likes. The engine depends on the man—the man depends on himself. The comparison between the man and the engine breaks, therefore, when we come to the question of responsibility; but to a large degree the comparison is sound, because, if man, using his responsibility, would tend his body as he tends an engine, he would be a far healthier and happier being than he is at the present time.

FOOD, DRINK, AND DIGESTION.

Man, like an engine, must have food and drink, and in order to understand the proper nature and quality cf the necessary food and drink, Dr. Richardson proceeded to explain, and to illustrate his lecture from lantern slides, exhibited on the screen with great skill by the Rev. A. B. Cotton. He commenced by showing the nature of the food and drink of the animal body, illustrating the food typically by a grain of wheat, a view of which was shown in great perfection. The different portions of the foods required were described, the fuel food—starch in the centre of the wheat grain—the flesh-forming food in the gluten cells surrounding the starch cells, and the layers of substance external to both which supply the small but necessary mineral matter for making the hard structures like tooth and bone; to all which solid foods, water, the only natural drink or fluid of life, had to be added in due quantity and purity. This finished, the digestive system was illustrated and explained, and, in two experiments, the natural process of digestion was shown in progress on the screen; in one instance where the digestion had just commenced, and in the other where it had proceeded to completion, and was ready to be thrown into the blood to make its round of the circulation, to maintain the warmth, and to build up the body. The different qualities of food necessary to the health of the body were described here, and vegetarian and animal foods were compared and contrasted. Both act as foods, both supply animal heat, and some persons can digest animal better than vegetable food; but if a person was obliged by necessity to select an exclusive vegetarian or an exclusive animal food, he would, by choosing the vegetarian, choose the more economical and healthier sort.

THE CIRCULATION AND AERATION OF FOOD AND DRINK IN THE BODY.

From the digestive organs of the body the lecturer proceeded to the circulatory and respiratory, by which the food taken up into the fluid called the blood is aërated or charged with air, and carried round the system to burn and to build. The veins were first illustrated, the rivers of life, which carry the blood to the heart; the heart was described, and the course of the blood from the right side of the heart to the lungs was carefully traced and depicted. Next, by means of a large diagram on the screen, the mode in which the blood comes into contact with the air and absorbs the oxygen of the air was illustrated; the blood coming over from the lung charged with air in its myriads of red corpuscles was also depicted, and was followed back to the heart, on the left side, from whence to pass, stroke by stroke, in pulsation all over the body by the arteries. A plate, "The Arteries," from the pencil of the great anatomist Albinus was here put on the screen, and called the arterial tree—that is to say, the system of vessels, on the termination of which all the organs of the body are formed. Finally, the whole circulating and breathing systems were shown together in one diagram, and the complete circuit of the blood from the veins and through the minute vessels called capilliaries into the arteries was exhibited to view.

THE WORK OF THE LUNGS, AND THE WORK OF THE HEART.

Bearing upon the health of the body, in relation to the parts above referred to, Dr. Richardson dwelt on the necessity, for health, of supplying the lungs with pure air. He spoke of the effect of particles of dust on the bronchial surface, explained how Nature provides a means for wafting dust that may have entered the bronchial tubes back from the fine terminations of those tubes; and showed how man, nevertheless, sometimes contrives, as in the case of potters, to inhale so much dust as to destroy the natural protection, and bring on disease of the lungs from the effect of dust. In respect to the heart, he dwelt on the danger of exposing that organ—always at work—to over-strain and excitement, and, by means of a diagram, he indicated the enormous amount of work which the heart has to perform in propelling the blood, work which in a healthy man is equal to the task of lifting 125 tons weight one foot high every 24 hours, in the course of which it beats 106,000 times. Some things acting on the body, and quite useless in their action, make the heart do much more work for no purpose, and wear it out too soon. Alcoholic fluids were chosen to illustrate this position, and a calculation was shown by which it was explained that the work of the heart in 24 hours could be raised to an extra amount equal to lifting 25 tons weight one foot high. Under such extra strain the heart so often becomes feeble and disabled that this effect of alcohol alone, apart from moral, economical, and other considerations, was sufficient to keep him (the lecturer) a water drinker pure and simple. If in this matter of fluid for the animal engine, the same care were taken as is taken with the steam engine, an entirely new reign of health would be inaugurated.

THE ORGANS OF LOCOMOTION.

The skeleton or rigid framework of the body was now put on the screen and described, and the mode by which this was deformed by being improperly fed was told. Then the skeleton of the foot was exhibited, and the manner by which the beautiful arch of the foot was destroyed and the foot made flat by wearing boots which altered the shape and bound down the arch to the common level or "flat-foot" shape and form was described. The muscular system came naturally under review after the skeleton; the action of muscles in moving the bones was brought under notice, and the value of proper training of the muscles by exercise was strongly commended. Some muscles, the lecturer shewed, were involuntary in their action, like those of the intestines and the heart; but they could be overworked and injured. Other muscles, like those of the limbs, were voluntary in their action, and they were often both underworked and overworked. The great point in muscular exercise is to make the muscles act equally and vigorously, without excess of fatigue, and with a due amount of sleep, during which the body makes up for losses and waste entailed under exertion. Touching on exercises, it was taught that every exercise which causes any kind of deformity, was either a bad exercise or a good exercise overdone. This was a very simple fact to remember.

THE PURIFICATION OF THE BODY.

The glands by which the body is relieved of superfluous watery fluids was next discussed, and the skin glands by which the perspiration is produced were carefully delineated, after which the importance of keeping the surface of the body cleansed by free daily ablutions was enforced. The great importance of keeping the glands of the body in natural activity was specially urged. It was the equivalent of that care which the engineer bestows on the perfect cleansing, oiling, and brightening up of his engine. The engineer says the engine that is foul or dirty is an ugly engine, is a disgrace to its keeper, and is sure to go wrong. Apply the same rule to the human engine, and what a different world we should have: a world of clean bodies, clean attire, and clean homes. Compare working engines, on this point, with working men, and engine rooms with working homes. The lesson suggested by the comparison is open to all who think for themselves.

THE HEALTH OF THE ORGANS OF SENSE.

The mechanism of the senses of sight, smell, and touch were explained and illustrated, as well as the great nervous centres, and the ramifications or branches from those centres called the nerves. It was shewn that there were two great nervous centres in the body, one governing those acts and motions over which we have no control, such as the movements of the heart and arteries, and the other governing the acts which are under our own control, and having its seat in the brain and and spinal cord. How these nervous systems act and re-act on each other, how exhaustion of the nervous system interferes with digestion and circulation, and how disturbed and too laborious digestion interferes with nervous function was explained, and rules of health were deduced from the explanation. The brainless, nerveless engine was troubled with no organs of sense. The engineers were the senses of the engine. But the engineer knew that four of his senses out of the five were wanted for his engine, viz., sight, hearing, touch, smell, in order to make the engine work correctly; and he brought these senses into the service, with far more skill and judgment than most men brought the same senses for the service of their own body, for their own safety, and their own health.

RECAPITULATION.

A short recapitulation brought the lecture to a close with the observation that if as much care were taken in keeping these working systems of the body in order as are taken with the clean, beautifully-tended, and much cared-for steam engine, then the human engine might equal the engine made by man in endurance, and then, indeed, would come the time "when there should no more be an infant of days, nor an old man who had not filled his days."

VOTE OF THANKS.

The Mayor said he did not think they could let that evening pass without giving a most hearty vote of thanks to Dr Richardson. The lecture had been very interesting and instructive, and was a most valuable addition to the Presidential Address on "The Health of the Body." Those present must have gained a large amount of mental food, and he hoped they might be able to carry out the principles of sanitation as regarded mind and body, of which they had heard, and so live healthier lives than they would have done without that knowledge. The views by which the lecture had been illustrated were excellent, and had enabled them to better understand the complex nature of a subject which was a most fitting conclusion of a most successful Congress. He had very great pleasure in moving a hearty vote of thanks to Dr. Richardson.

Mr. Knight seconded, and said he hoped the lecture would be published in a cheap form, so that the working-classes could have it in their homes. He believed it could be accomplished, and such a lecture was indeed worthy of circulation.

Dr. Richardson returned thanks in a few words, and the work of the Congress was brought to a close.

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